East Engin. Library

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLXXII. No. 3261.] LONDON, NOVEMBER 11, 1925. [77TH YEAR. PRICE 1s.

OXIDE OF IRON
SPENT OXIDE

GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C.2.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 LONDON WALL.

Makers of
GASHOLDERS,
TANKS (C.I. or Steel),
PURIFIERS,
WASHERS,
ROOFS,
&c.
SULPHATE OF AMMONIA PLANT
Complete GAS WORKS
ASHMORE, BENSON, PEASE & CO., LTD.,
STOCKTON-ON-TEES.
Telegrams: "GASHOLDER."
London Office:
20, Victoria Street, Westminster, S.W.
SEE ILLUSTRATED ADVT. LAST WEEK, PAGE 308.

ASK BERK
SULPHURIC ACID
made from Spent Oxide, for
SULPHATE MANUFACTURE
F. W. BERK & Co., Ltd.
106, Fenchurch St., E.C.3
Works - - Stratford, E., and Morriston, *Glam.*
TAS/ch36

"TORBAY PAINT"
FOR ALL PURPOSES.
The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C.
51, Old Hall St., LIVERPOOL.

"BLUEBELL"
SILICA RETORTS
(95% SILICA)
John G. Stein & Co., Ltd.,
Castlecary, SCOTLAND.

Telephones:
3966 VICTORIA.
3967 Do.
Telegrams:
"GASIFICATION, Sowest, LONDON."
WALTER MOORE & SONS,
GAS COAL & COKE CONTRACTORS,
72, VICTORIA STREET,
LONDON, S.W. 1.

W. & B. COWAN
Incorporated in Parkinson & Cowan (Gas Meters) Ltd.,
LONDON. MANCHESTER. EDINBURGH.
GLASGOW. BELFAST.
(See Advertisement on p. III. of Wrapper.)

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
ASTOR HOUSE, ALDWYCH, LONDON, W.C.2.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

SEE ILLUSTRATED ADVERTISEMENT CENTRE PAGE X. LAST WEEK.
R. & J. DEMPSTER, LTD. MANCHESTER.
London Office:
34, VICTORIA STREET WESTMINSTER.

Radiation
LIMITED
(Advt. in Centre of "Journal.")

ROBERT DEMPSTER & SONS LTD
ELLAND
See Illustrated Advertisement Inside

Unlike Red Oxide, "FERRODOR" will NOT absorb destructive chemicals from air. IDEAL for GAS HOLDERS and STEEL WORK.
Also supplied in all other Colours Ready for Use.
NATURAL STEEL GREY FERRODOR (Regd.) LEADING PAINT
GRIFFITHS BROS. & CO., LONDON, LTD., Macks Road, Bermondsey, London, S.E. 16.

BURT, BOULTON & HAYWOOD LTD

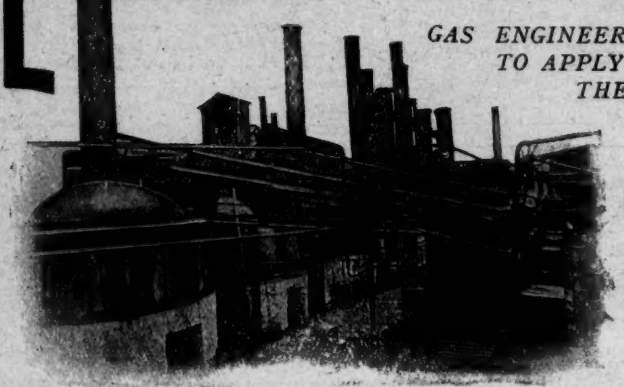
CO-OPERATIVE DISTILLATION OF TAR

GIVES MAXIMUM RETURN TO GAS COMPANY

WE were among the Pioneers of the Co-operative Movement for the Distillation of Tar, and we are to-day operating such schemes with Gas Companies in

London and the Home Counties -	**PRINCE REGENT'S TAR DISTILLERIES**
South and West of England - -	**SOUTH-WESTERN TAR DISTILLERIES**
South Wales - - - - - -	**SOUTH WALES TAR DISTILLERIES**

GAS ENGINEERS & MANAGERS ARE INVITED TO APPLY FOR PARTICULARS TO THE HEAD OFFICE:—



Salisbury House,
London Wall, London, E.C.
'Phone: London Wall 7569—7573.

WORKS —Silvertown (London); Eling (Southampton); Port Tennant (Swansea); Maesycwmmer (Mon.); and in France, Belgium, Spain, &c.

HIGH PRESSURE GAS DISTRIBUTION AND BOOSTING.

SEND FOR CATALOGUE ON THIS SUBJECT.
OR ONE OF OUR EXPERTS WILL BE PLEASED TO CALL TO ADVISE.

PLANTS SUPPLIED TO FULFIL ALL CONDITIONS.

OUR PATENT DISTRICT GOVERNORS reduce from any pressure on the inlet up to 50 lbs. per square inch in one stage, down to the ordinary district pressure, and the low pressure is maintained constant, independent of all variations in demand and in the pressure on the inlet side. Absolute certainty of action under all conditions.

HIGH & LOW PRESSURE SERVICE REGULATORS.
REGULATORS FOR METERS, GAS FIRES & STOVES.
PATENT DOUBLE FACED GAS VALVES FOR HIGH & LOW PRESSURES.
RATEAU TURBO GAS EXHAUSTERS FOR BOOSTING, &c.
ROTARY & RECIPROCATING COMPRESSORS.

MEMBERS OF BRITISH FURNACES LD MAKERS OF GAS FURNACES FOR ALL INDUSTRIAL PURPOSES

THE BRYAN DONKIN CO., LTD
CHESTERFIELD.

GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

(Founded in 1849 as the "Journal of Gas Lighting.")

PROPRIETORS: WALTER KING, LIMITED. OFFICE 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL CLXXII., No. 3261.] WEDNESDAY, NOVEMBER 11, 1925. [77TH YEAR.

EDITORIAL NOTES.

The Gas Industry before the Coal Commission.

On two days last week, the Coal Commission heard evidence from the gas industry; and they will be receiving more this week. The Commissioners will no doubt have been impressed by the promptitude with which the industry, vast as are its operations, produced its data and its case. Of course, the reason for this is that, coal being its chief raw material, the industry knows well the facts of its requirements, the influence that the cost of coal has upon its operations, the degrees of efficiency with which it deals with the coal, together with the effects upon that efficiency of the condition in which the coal is delivered. Standing head and front among the users of coal in the matter of efficiency in utilization, it is only natural that information concerning the position of the industry should be placed in the possession of the Commissioners, because it is impossible for them adequately to deal with the main part of the reference to them without studying the effects of what is done at the collieries upon the interests of the country. The industry, however, has officially nothing to say upon the question of miners' wages, hours of employment, the overmanning of the coal industry, or the reduction of output per man-shift. Those are matters which can better be treated by other witnesses. Nevertheless, the evidence of the industry has a direct bearing upon the operations of the coal industry, through the considerations and illustration it advances regarding the importance in the national interests and well-being of keeping the cost of coal as low as possible, of maintaining free competition as between colliery and colliery, and of sending coal from the collieries in as clean a condition as is economically practicable. In these respects, the Commissioners will not fail to see the constructive import of testimony such as they heard last week in respect of their deliberations and ultimate recommendations.

The evidence tendered was by Dr. Lessing and Mr. D. Milne Watson. The former witness dealt with requirements and possibilities, and the latter with actualities. One thing that is striking in the evidence of both is how research which has led to the advance of efficiency in the utilization of coal by the gas industry has had a material set-off through the unrefined condition in which coal is sent from the collieries, and which causes monetary waste from the beginning of the movement of the coal to the price of the products derived from it. The evidence of the two witnesses was complementary. Good as has been the progress of the gas industry in public service as shown by Mr. Milne Watson, it might have been better had the conditions prevailed which are the goal of the testimony advanced by Dr. Lessing. The latter is convinced that there would be an ultimate financial gain to the coal industry itself by a better preparation of coal for the market. A much larger tonnage than is now the case should be passed through washing plants, and the efficiency of the washing process should be considerably increased. To augment the intrinsic value of the coal, would increase its worth to the users; and this applies especially to the lower grades—slacks, for example—which would command higher prices than they do to-day. Of course, the monetary waste to the country inflicted by removable ash in coal can only be illustrated by computation. But roughhewn though Dr. Lessing's figures are, they must have deeply impressed the Commissioners respecting the uneconomy of the more or less crude manner in which the mining industry deals with its supplies of coal to the country. Assuming an average of 10 p.ct. of incombustible material in coal, this would mean 25 million tons of useless stuff, the carriage of which (at an average of 3s. 7d. per ton) would amount to about £4,500,000 per annum, while at least double that sum would have to be spent on the collection and disposal of the ashes. Then there is the uneconomy inflicted upon industry through the lowering, by the incombustibles, of the efficiency of plant and operations, which uneconomy it is wholly impossible to assess financially. It is clear, however this matter is examined, that 2s. per ton spent on cleansing at the pits would be of immense advantage to the country. Certain it is that in the gas industry works efficiency and coke quality would be much enhanced if we could realize the refinement advocated by Dr. Lessing—coal containing only 2 or 3 p.ct. of ash, and even less. The advantages would also apply to the coal and coke using industries. It is interesting to note in this connection that Dr. Lessing's view is that the gas industry has still in hand a good margin of potential technical improvement—partly in the saving of coke for heating retort-settings, and partly in the raising of efficiency in the recovery and preparation of products. Through this, the progressive expansion of the industry (which is certain) will not involve a corresponding increase in the consumption of coal. However, the evidence of Dr. Lessing showed possibility which, as he acknowledged, cannot be applied so as immediately to produce reformation in the coal industry, which has lagged behind in research and in producing improvement in its commodity, to its own and the national disadvantage. At the same time, Mr. Milne Watson admitted in his evidence that there has been improvement in respect of ash in coal, though that supplied to the Gas Light and Coke Company still averages 8·4 p.ct., as compared with 6·3 p.ct. before the war, which means that, in every 100 tons of coal purchased, there are to-day 2 tons more of incombustible material, which represents on the Company's coal purchases 40,000 tons of incombustibles paid for as coal in excess of pre-war conditions, while the 8·3 p.ct. of incombustible material on the Company's total purchase of coal in a year is equivalent to nearly 170,000 tons. If the 8·3 p.ct. was reduced to Dr. Lessing's ideal of 2 p.ct., the Company would save the buying, transport, and handling of 128,000 tons of coal a year.

The masterly review by Mr. Milne Watson of the position of the industry in the public service, and how much the maintenance and advance of the service depends upon coal, must have been highly enlightening to the members of the Commission, and will be valuable to them in their deliberations and recommendations, as was that of Dr. Lessing. In high quarters, there appears to be little appreciation of the place that the industry occupies in public and industrial service; and it is partly owing to this, and partly to misconception, that in the political realm there has been so much ebullition over electricity development and low-temperature carbonization. The relativity of service and economics, actual and potential, has never been thoroughly considered; but with the publication previously made regarding electricity, and the statistical information Mr. Milne Watson placed on record last week, there ought not to be further hesitation in assigning to the gas industry its rightful place in the national system and service. Moreover, the extravagant statements of

interested parties respecting low-temperature carbonization should find their proper level after the notable comparisons as to yields and values, and the resulting balance for profits and working charges, which were submitted. It will be seen that, taking the figure found necessary in connection with gas-works operations and trading, the low-temperature financial results cannot possibly prove remunerative under prevailing or prospective conditions. The investigation which has been made of these matters and the tabulated results will be valuable not only for the purpose for which they were employed on this occasion, but for use in discussions of the relative merits of the high and low temperature systems. Much has been heard of the various low-temperature systems from the technical point of view; and technically they have had painfully slow growth. Less, however, has been heard of them from the commercial standpoint; and what has been stated has invariably been vague and inconclusive or inflated. The tabulations in Mr. Milne Watson's evidence throw new light upon the commercial aspect of the subject; and they show how little chance such systems have of commercial success unless the products are required for special purposes, or the plants are in specially favourable areas, or the coke can be sold at a higher price per ton than the original coal. It appears, too, that the assertions as to success in other countries have been found, by engineering investigation on the part of the Gas Light and Coke Company, to be mythical, save in the case of one plant in Germany, which is in a district where there is no competition. However, it will be of considerable service to the Coal Commissioners to have this information as to low-temperature carbonization before them for investigation, together with the statistics as to the position of the gas industry, and the effect that increases of price of coal have upon the millions of gas consumers throughout the country. It will also be noted by them that the gas industry is spending large sums of money annually in research, in order to promote further efficiency in coal and gas utilization, which efficiency subscribes to the conservation of coal. In this direction, including the purification of the atmosphere, the gas industry can claim to have accomplished more than any other industry. There is proof of this in the figures presented by Mr. Milne Watson.

Competition with Gas Coke.

WHEN householders have been educated up to using coke, and it is everywhere of such quality that they prefer it to coal (to create which state is an ideal worthy of our best efforts), the 38 million tons or so of coal which is now used for domestic purposes assure us that there will be room for the domestic and ordinary industrial coke produced by both the gas and the coke-oven industries. That is, providing the managements of all gas undertakings realize that the time has come for them to tear themselves from tradition, and treat and prepare the raw material from which coke is made in the same sensible way that other industries treat and prepare the raw material from which their commodities or goods are produced. It is no use turning a blind eye to facts, or trying to hide them behind a screen of silence. Some people hold up their hands in pious horror when there is a suggestion of acknowledging in print what has become a matter of common knowledge. In regard to coke, the time has come when such nonsense can be, and must be, ignored.

And why? We hear from different quarters of the country that coke-oven household coke has become a very real competitor, and, what is more, is preferred to the ordinary local gas coke. Some of the Scandinavian buyers have also been transferring their custom from gas coke to the coke-oven brand. These are facts which prudence says must be faced. When we inquire the reason for preference, it is stated that for water-heating and central heating there is less trouble from ash, and re-charging is not required so frequently as with some forms of gas coke. Why is this? Because the coal is washed, and there is suitable quantitative blending of coals according to their individual characteristics; and thus low ash content and good combustible properties are secured. The gas industry has (to the extent that is economically possible) to follow the coking industry in this matter—at any rate, where it is not already given, attention must be bestowed upon the questions of ash and moisture. When a start is made in this, developments in other respects will follow. In reasoning out the matter, the cost of performance has to be set against the loss through non-performance; and, looking forward, the cost in loss through neglect may be overwhelmingly against the gas industry.

The competition has only during the past few months got properly on its feet. It is not something that is a mere passing phase; propaganda has started in favour of coke-oven domestic coke, and we have heard that coking plant is being constructed or contemplated especially for the domestic business. As we have said before, there is plenty of room for both the gas and the coke-oven industry in the domestic market, when the preference has been cultivated and established for household coke to the displacing of household coal. But that time has not come; it will only come gradually. Meanwhile, we have seen that quality of coke tells. The circumstance of coke production at a gas-works does not prevent sales of better quality coke from a distance at almost the very gates of the works. Are gas undertakings going to allow the competition to grow without making a grand effort, through coke quality *plus* local production, to create markets for the whole of their coke? The past neglect of gas consumers' appliances was of material service in the success of the electricity industry. Is the neglect of scientific coke production going to allow the domestic coke business progressively to pass from the hands of the gas industry? A beginning has been made. Years hence some investigator of the history of coke in these times may read this question: Will the time come when the coke-oven industry will be making domestic and ordinary industrial coke as a primary product, with the metallurgical variety taking second place quantitatively, through a more limited and variable demand than the other market offers? The answer rests in the hands of the gas industry—Now.

It is no use crying over what might have been. But we to-day believe that, in the national economy, it would have been a good thing to have had the gas, electricity, and coking industries as one, instead of disunited entities, so that there could have been co-ordination of the provision of the domestic and industrial requirements of the country for light, heat, and power. It is too late to consider that. But in regard to the conditions that have grown up, the one satisfaction is that separation and competition have meant stimulation, and from that the country has gained. Whether the gain has been more or less than would have been the case by amalgamation into one, cannot be definitely said; in regard to it we can only indulge in speculation and surmise.

While writing, it may be interesting to our readers to know that for the extra issue of the "JOURNAL," containing the twelve leading winning papers in the Coke Competition, applications were received exceeding our anticipations. Some came from unexpected quarters. We are satisfied that the competition has raised an interest in coke supplementary to that produced by a bad market and the new work of the coke-oven industry to increase the area of their markets.

Logic of the Electricity Commissioners.

THERE were many points of interest in the address of Dr. Carpenter at the meeting of the Gas Companies' Protection Association last Thursday; but one matter was particularly so. A piece of work for which the Association has been directly responsible is the Statutory Gas Companies (Electricity Supply) Bill, which received the Royal Assent in July. It enables statutory gas companies to apply to the Electricity Commissioners for Special Orders for the supply of electrical energy. For the piloting of the Bill through Parliament, there is great indebtedness to Mr. Reginald Clarry; and this was well expressed by both the Committee in their report and Dr. Carpenter in his address. The measure may be highly valuable. We emphasize the "may be," and hope it will be. But when one considers the expressed views of the Electricity Commissioners on the Bill when in Parliament, together with what happened in connection with the Horley Gas Company's Bill, as related by Dr. Carpenter, one becomes a little sceptical as to the powers under the Act receiving

generous recognition and being allowed to become fully operative. It is clear from the statement submitted by Dr. Carpenter as to the general views of the Commissioners that their leaning—it might even be described as bias—is towards electricity companies or other supply bodies receiving preference over a gas company. What the Commissioners actually state is that they "would not consider that a proposal to entrust electricity powers to a gas company should be opposed on principle; but they recognize what must be perfectly obvious to everybody, that on general grounds it is preferable that the supply of electricity should, where a company or body of people are able and willing to undertake it, be in the hands of the body whose primary and sole duty should be the supply of electricity." There we see the old rooted electrical jealousy opposing itself to economic facts. Hidden behind the words is the weak suspicion that, at the hands of gas administrators, electricity supply would not have fair and plenary play; that the gas undertakers would be so mad as to invest capital in electricity supply, and then deliberately prevent its being utilized to its full power; that, furthermore, they would not take advantage of their position to raise capital cheaply on the combined undertaking, or of their other resources which would enable cheap administration and supply within the limits of the opportunity offered by the area. We therefore suggest to the Commissioners that what they allege is "perfectly obvious to everybody" is something that is only obvious to those who take the narrow prejudiced view that ordinary business acumen would be thrown aside by gas administrators on extending their business to electricity supply.

The Commissioners would be enlightening many people interested in this matter if they would inform them what there is in the present state of the gas industry, or in the experience of dual supply of gas and electricity, which suggests to them that gas administrators would adopt one standard of business method for a part of their business and a different standard for another part.

However, the Commissioners are not altogether unmindful of the fact that even in electricity supply a gas undertaking may be useful, in that it could take up the supply of an area which would not be of any use to independent suppliers. "They think there may be cases "where it is right and proper that the supply of electricity "may be entrusted to a gas company, because in some "cases it may be the only means by which a district can "get a supply of electricity. The prospects may be so "poor that no body or company, except the gas company, "may be able to deal with the situation." Thanks! The Electricity Commissioners can exhibit joculârity as well as tendencies and bad logic. If gas undertakings are able to deal with such a poor situation, then surely they would be able to do so in more favourable circumstances to the advantage of the district. But the Commissioners are anxious not to let the gas industry think that they are not prepared to act judicially, or that they are only willing to entertain applications from them for districts which are too poor for independent suppliers to tackle, for they add: "It must not be supposed that in every case "the Commissioners would think that the supply should "be entrusted to the electricity company, because there "may be cases where a gas company could show such "an overwhelming advantage for their being given addi-"tional powers that they would even outweigh a scheme "put forward by an electricity company." Examining this statement against the preceding ones, it is clear that what a gas company might regard as a case showing overwhelming advantage might not be so considered by the Electricity Commissioners. It is a strange thing for a body endowed with statutory authority to deal with applications made also by statutory authority to disclose in this fashion their predilection and general attitude. It reduces the value and operative effect of an Act passed by Parliament to a quantity which is hardly worth having; and that is a fact which should be brought to the notice of Parliament itself. It is hardly worth passing Acts of Parliament if their operation is subject to a body whose attitude towards what is proposed takes such absolute lines as those freely defined by the Commissioners when the Bill was in Parliament. Dr. Carpenter says: "There are fundamental reasons why, in circum-"stances where it is possible, there should be joint con-"trol—not only in the interests of the gas undertaking "or of the electricity undertaking, but in the interests "of the public."

Treatment of Crude Gas.

It was left to Dr. Bailey, Chief Inspector under the Alkali Works Regulation Act, to point out some time ago that though considerable changes have been made in gas-manufacturing processes, and the gas is different in chemical composition, very little attention has been bestowed by technical gas men upon the improvement of the succeeding gas condensing and cleansing processes. Dr. Bailey's attention was directed to the subject mainly by the objectionable constituents found in ammonia plant effluents—mainly tar acids (usually phenols), or the oxidation products of ammonium sulphide and cyanide (thiosulphate and thiocyanate), the phenols being particularly found in liquors from vertical retort installations. A paper which Dr. E. W. Smith and Mr. T. Campbell Finlayson read at the auxiliary meeting of the North of England Gas Managers' Association last Saturday gives an account of work that has been proceeding on the subject; and it shows that some interesting plans for improving the treatment of crude gas have been proposed, and are under consideration. But so far they are mostly immature schemes—some more promising than others. The gas industry freely admits the indictment that the purification processes as practised have got into a rut, and that the only alteration that has been made has been by extension, and not by the application of new principles. The industry has made vast technical progress in many directions; but nevertheless it can never be charged with having made hasty departure from its ways. Caution and proof of economic applicability have been prominent in its actions; and the proof has been the more difficult to realize because of the caution. This applies to the condensing and purification systems perhaps more than to any of the other processes; and, if anything, the paper by Dr. Smith and Mr. Finlayson accentuates this, because of all the plans they sketch which are fundamentally different from, or are extensions of, existing practice; there is not one which has been put to critical test in the everyday operations of a British gas-works. However, we hope (if greater efficiency and economy can be assured) that more scientific principles may result in the processes subsequent to gas production from Dr. Bailey's friendly censure, and the investigation of the possibilities of new schemes by Dr. Smith and Mr. Finlayson and other workers—preceding and contemporary.

What Dr. Bailey is chiefly concerned about is the disposal of ammonia plant effluents. As he has pointed out—and this is emphasized in the present paper—the troubles attending liquor disposal would be materially decreased by reducing the volume of the effluent, by having minimum contact between tar and ammoniacal liquor, by preventing oxidation of the liquor, so keeping thiocyanate and thiosulphate largely out of it, and by evaporating the devil liquor by waste flue gases, instead of mixing it with the still effluents. The question is, are there practical means of effecting these desiderata? Good confidence exists in the minds of Dr. Smith and Mr. Finlayson that there are. The means suggested by them for the reduction of the quantity of waste liquor and increasing the strength of the ammoniacal liquor is the installation (after the condensers and one mechanical scrubber) of an acid catch to remove the last 40 grains or so of ammonia. Through this catch the acid to be used in the manufacture of the sulphate would be first passed, and then, containing a certain amount of ammonium sulphate in solution, it would be used in the saturator in the normal way. The old recognized difficulty of bringing the gas into direct contact with sulphuric acid, owing to the depreciation of illuminating-power, has disappeared with the establishing of calorific value as the property to be considered. It is believed that by the suggested system a liquor strength of 16 to 18 oz. (3·5 to 4 p.ct. NH_3) would easily be obtained; and the amount of thiocyanate and other objectionable constituents in the liquor would be less. By calculation it is shown that there would be a reduction per ton of sulphate of ammonia of about 50 p.ct. in the gallons of liquor to be distilled, in the steam required,

and in the liquor for disposal. These are important considerations; but the results of practical working tests will be desired to give ultimate satisfaction.

With regard to bringing about minimum contact between the tar and ammoniacal liquor, the authors see no adequate reason why the major part of the tar should not be separated from the liquor at an earlier stage than present practice. The aim should be to bring down the tar before the ammoniacal liquor, as this would give an ammoniacal liquor more free from undesirable constituents, and a tar more easily dehydrated. Alternative methods of doing this are suggested. Regarding the formation of thiocyanate and thiosulphate, their increase is brought about by contact between the liquor and air, and by increase of temperature. This points to the necessity of mains and condensers being kept as free as possible from air leaks (although air leakage in such plant is not a condition permitted in well-regulated works), and the temperature of the liquor reduced as early as possible. The liquor, too, should be stored for as short a time as practicable before being subjected to distillation. The authors support Dr. Bailey's suggestion that the devil liquor should be evaporated by waste flue gases in shallow cast-iron pans. Inasmuch as the devil liquor contains about 40 p.ct. of the total phenol of the original ammoniacal liquor, the evaporation would tend to reduce effluent liquor troubles to more negotiable proportions.

There are other interesting sections of the paper, among them being one dealing with the Koppers Company's system of liquid purification of gas—about which one would like data as to effectiveness and capital and running costs. There will also be keen watchfulness for the results of a working-scale plant, on the system patented by Dr. Arthur Jaques and Messrs. J. H. West and J. S. Morgan, for producing sulphate of ammonia without the use of sulphuric acid. Everything—changes in practice not excepted—must have a beginning; but the professional men of the gas industry are conservative, and have a strong penchant for definite operating results before committing themselves to endorsement by adoption of new methods. However, at the moment, the proposals for practically dealing with the difficulties attending waste liquor disposal constitute the immediately important feature of this highly suggestive paper.

Southern Association Jubilee Dinner.

The members of the Southern Association of Gas Engineers and Managers, from the centre of its activities to the far corners of its large area, will desire to take part in the Jubilee Dinner to be held at the Hotel Cecil, on Wednesday, Nov. 18, which is the day of the general meeting. We hope the desire of the many will materialize; for naturally the Committee are extremely anxious to secure a fully representative gathering to make the occasion a lasting memory. Among those who, we believe, are expected to be speakers on the occasion are Mr. D. Milne Watson, Dr. T. Lewis Bailey (Chief Alkali Inspector), Mr. C. F. Botley (President of the Institution of Gas Engineers), Dr. Charles Carpenter, Sir Arthur Duckham, and Mr. Henry Woodall. Members will greatly facilitate the making of arrangements for the occasion if they will at once—in as large numbers as possible—apply for tickets (12s. 6d.) to the Hon. Secretary, Mr. H. C. Smith, Gas Offices, 639, High Road, Tottenham, N. 17.

The Coke Conference.

Further particulars of the arrangements for the Coke Conference in Sheffield on Nov. 20 are published on a later page. As admission will be by ticket only, anyone who has not received one, and desires to be present, should apply to the Hon. Secretary, Chemical Engineering Group, 307, Abbey House, London, S.W. 1.

Mutual Respect.

The Gas Light and Coke Company opened new showrooms and district offices in Islington last Thursday. There was a little ceremony on the occasion, in which the Mayor of Islington (Mr. Sidney G. Harper, J.P.) and the Governor of the Company (Mr. D. Milne Watson) took part. Several members of the Electricity Committee of the borough, and councillors not only of Islington but surrounding municipal areas were present. From the electrical visitors there were the heartiest wishes for "Good luck" to the new gas enterprise; and the Governor expressed the hope that the Company and the borough, through its electricity undertaking, would go hand in hand to make Islington what all present desired to see it—a smokeless borough. In opening the new premises, a point was made by the Mayor which is often overlooked by municipal authorities owning electricity concerns. His Worship stated that the Borough Council took an interest in an industry which not only supplied 3000 public lamps in the district, but contributed substantially to the rates. Like Mr. Milne Watson, he hoped the gas and electricity services would run side by side in healthy competition, and he wished the Company the success merited by their enterprise in the district. Some local authorities, when depriving gas undertakings of participation in the street-lighting business, close their eyes to the fact that they are large ratepayers; they also appear to forget that gas undertakings are engaged in a service of vast importance to the comfort, convenience, and health of the other ratepayers; and that they are doing work which contributes magnificently to that most desirable condition—the purification of the atmosphere from smoke. So long as the public lighting is done efficiently by gas, local authorities, in coming to decisions regarding it, should consider the part taken by the gas undertaking in subscribing materially to the well-being of the administrative area. Unfortunately, however, some municipal authorities treat gas suppliers as though they are not public servants, and have no right to exist.

Rating and Valuation Bill.

The Government have decided that the Rating and Valuation Bill shall be carried through the remaining stages before Christmas.

Smoke Abatement Bill.

At a recent luncheon at Halifax, the Right Hon. Neville Chamberlain, Minister of Health, stated that he hoped to introduce the new Smoke Abatement Bill into Parliament in the coming year. That is not news. What many people would like to know is what the Bill is going to contain, so as to be able to judge whether or not it is likely to be of real assistance in bringing about a more wholesome atmosphere.

Leeds University Appeal.

The West Riding Coal Owners' Association have made a donation of £25,000 to the Leeds University Appeal. The fund, at the time of our last information, stood at £201,210 towards the £500,000 required. Those connected with the gas industry will remember that contributions can be earmarked for the Coal Gas and Fuel Department, which at present shares quarters with the Mining Department.

The Middle Class in Industry.

The Society of Technical Engineers appear to be showing a good deal of pugnacity, which has been stimulated by one or two incidents lately. The Engineering and Allied Employers' National Federation have given indirect indication of their unwillingness to have anything to do with the Society; and the Trade Union Congress saw fit a short time ago to pass a resolution expressing disapproval of attempts "to foist upon industry third party ideas concerning the position of administrative staffs." The Society seem to stand a good chance of being crushed between the upper and the nether industrial stones. The Employers' Federation have promoted a new Staff Benefit Society; and they have made it a condition that members are not to belong to any professional protective organization. The Executive Council of the Society of Technical Engineers have therefore called upon all members of the engineering profession to refrain from joining the Staff Benefit Society; and the reasons they give are that the condition referred to deprives the members of their common rights of citizenship, is an affront to the engineering profession, and an attack upon the peaceful policy of the third party in industry. Employers in the engineering industry have found it bad enough to have a second party in it; and it is easy to understand their unwillingness to have a third party putting their oars into their affairs. At the same time, we admit that in regard to staff salaries there have been many instances where effective intervention would have been useful. The Society of Technical Engineers state that they would welcome the participation of the Employers' Federation in promoting a staff benefit scheme without the "obnoxious" condition attached. Naturally the Society

could not participate in a scheme which obviously sought to bring about their demise. The Trade Union Congress, in their resolution, declare that there can be no middle position between employers and labour. The action of the Congress is regarded by the Society of Technical Engineers as an unwarranted effort to coerce organizations of professional and administrative staff workers into the ranks of Labour, and to dictate to them what their policy shall be. The Executive Council therefore reaffirm their "adhesion to the third party position, in the confident belief that complete independence of control by the organizations of both the employers and the manual workers, such as the third party position secures, is the right policy for protective associations of professional and administrative staff workers."

A Terrifying Disaster.

Hydro-electrical generation has its difficulties; and Lake Eigiau in the Conway Valley has proved that a huge lake at 1400 ft. above sea-level, the waters of which are dammed, may be the source of a serious catastrophe. The bursting of the dam on Monday night last week caused the loss of some thirty lives; and the rushing torrent down the valley swept away a terrace of houses, a main road bridge, a village church, and did other considerable damage to whatever stood in its path. The water invaded the Dolgarrog power house, and caused an interruption of the supply of electrical power in an extensive area of North Wales. The hydro-electrical works are operated by the North Wales Power Company; but fortunately for the supply of their large area the station is not the only one upon which they depend, so that the affected district was soon able to obtain relief from the generating station at Cwmdyl.

Labour Alliance and the N.U.R.

The new Labour Alliance is not to have as a partner the National Union of Railwaymen. The Executive of the Union have adopted a policy in the matter, and from this they will not depart. That this important element in the trade union world would not be drawn into the scheme was made almost a certainty last Thursday, when, at a conference of the Unions concerned, an amendment proposed by the N.U.R. was rejected. It was to the effect that a condition of membership of the Alliance should be that the unions in the several industries should prepare schemes for fusion wherever possible, or endeavour to promote a unified policy. Rather than renounce what they regard as the primary *sine quâ non*—adhesion to the principle of industrial unionism and unity of the unions in each industry—the Executive of the N.U.R. have decided that their organization cannot be a party to the Alliance. No one thought that such a body as the railwaymen would consent to be brought under the domination of the Communists, who have been the most active spirits in promoting the new Alliance, nor do we think that they would be prepared to give up a large part of their present unfettered autonomy by bringing themselves under the voting power of the other elements in the Alliance.

A Large Electricity Authority.

The London and Home Counties Joint Electricity Authority held its first formal meeting last Wednesday. The importance of the occasion was marked by Sir John Snell, Chairman of the Electricity Commissioners, being present to inaugurate its work. The new authority consists of 33 members, 24 of whom represent local authorities. The area of electrical jurisdiction is approximately 1858 square miles; and it contains a population of 8,250,000. The area comprises the counties of London and Middlesex, large portions of the counties of Essex, Hertford, and Surrey, and smaller portions of the counties of Berks, Bucks, and Kent. The district has within its boundaries the City of London, twenty-eight metropolitan boroughs, three county boroughs, thirteen municipal boroughs, eighty-seven urban districts, nineteen rural districts, and parts of twelve other rural districts. There are forty-three local authority undertakers and forty-four company undertakers (including five power companies) authorized to supply electricity within the district. The total capital expenditure on all the electrical undertakings in the district at March 31, 1925, was approximately £51,000,000. Sir John Snell states that consideration has been given to the probable requirements of London (say, fifteen years hence); and there are good grounds for thinking that by that time the load will have increased to 1,682,000 KW. —an increase of practically 1,000,000 KW. on the year 1925—and that the output will have grown to over 4000 million units. The functions of the authority will include helping the Commissioners to bring about a reduction of the numerous pressures and systems now extant, and, as far as is practicable, to simplify and standardize the numerous tariffs and methods of charge now in vogue. The supply of areas electrically unoccupied will have to be considered. The authority has power to borrow money up to a present limit of £7,000,000; and they may issue stock. The first Chairman is Alderman Duncan Watson, who is a member of the Marylebone Borough Council, and of the Institution of Electrical Engineers. He says his dream is to place London in the van of electrical progress. Those who have hitherto had the control of the development of electricity supply in London have had a similar dream; so there is nothing new in that.

PERSONAL.

Mr. C. BATEMAN, who has been selected for the position of Assistant Engineer and Manager to the Bath Gas Company, was appointed to his present post as an Assistant Engineer to the Cardiff Gas Light and Coke Company some three years ago. Previously he was an Assistant Engineer at the Beckton Works of the Gas Light and Coke Company, after having served an articled pupilage at Leeds and Beckton under Mr. W. B. Leech. It is interesting to note that Mr. Bateman this year secured a Diploma in Gas Engineering under the Institution Education Scheme.

Mr. A. G. CHEAL has severed his connection with the Crowborough District Gas and Electricity Company; and Mr. EDWIN M. BAIGENT has been appointed to succeed him as Secretary.

The polling took place last month for a successor to Mr. H. T. Manley as an Employees' Director of the South Metropolitan Gas Company. For the first poll there were 26 candidates; and the result was to place at the top Mr. W. C. Beard, a former Director, and Mr. H. Frost, coal foreman at East Greenwich; but neither of them polled the requisite proportion of votes to secure a return. In accordance with rule, these two names were again voted on, with the result that Mr. FROST was elected by a majority of 750 votes. Mr. Frost has been 23 years in the service of the Company.

OBITUARY.

We are sorry to learn of the death of Mr. ALBERT E. GUEST, who was Managing-Director of the New Conveyor Company, Ltd. Mr. Guest joined the Company in 1910 as General Manager, and a year or so subsequently was appointed to the position of Managing-Director, which he filled to the end. He was on the Council of the Society of British Gas Industries, as Chairman of the Conveying Plant and Labour-Saving Machinery Section. The circumstances of his passing away were of a tragic character. Just a month previously, he entered a nursing home for an operation for appendicitis; and shortly before his collapse took place he was to all appearance progressing favourably, and was looking forward to an early return home.

Chartered Institute of Secretaries.

The annual dinner of the Chartered Institute of Secretaries was held last Wednesday, at the Hotel Victoria, under the presidency of Mr. Jas. W. Slack, of Radiation Limited. About 240 members and guests were present, among them being several men distinguished in the service of the country and in industry. The great popularity of the President was attested by the number present and the speeches made during the evening, which was so highly enjoyable that it passed all too quickly.

Institution of Gas Engineers and the Public Works, &c., Congress.—Members of the Institution of Gas Engineers are invited to attend the conference arranged by the Institution to take place at the Public Works, Roads, and Transport Congress and Exhibition at the Royal Agricultural Hall, London, at 11 a.m. on Wednesday, Nov. 25—the President (Mr. Charles F. Botley) in the chair. The following papers are to be read and discussed: "Public Lighting by Gas, with Special Reference to Automatic Systems," by Mr. C. S. Shapley, of Leeds. "Valuation of Gas Undertakings for Rating Purposes," by Mr. George Evetts, of London. Tickets of admission and copies of the papers can be obtained on application to the Secretary of the Institution, No. 28, Grosvenor Gardens, Westminster. On the previous morning (Tuesday, Nov. 24), in connection with the session arranged by the Associations of Local Authorities, a paper on "The Use of Tar in the Construction of Roadways" will be presented by Mr. Thomas Glover, C.B.E., of Norwich, and Mr. Arthur Collins, late City Engineer, Norwich.

NORTHERN STAR LODGE, No. 3053.

Twenty-First Anniversary.

On Wednesday of last week, at the Midland Hotel, Manchester, the Northern Star Lodge, No. 3053, celebrated the twenty-first anniversary of its consecration. The Earl of Derby, the R.W. Provincial Grand Master of East Lancashire, P.G.W. (Eng.), who consecrated the Lodge, was unfortunately unable to attend the meeting, which was presided over by the Reigning Master, W. Bro. James Bridge, who made suitable reference to the auspicious occasion on which they were met together. He extended a very hearty and cordial welcome to officers of Grand Lodge present, among whom were W. Bro. Verney Clayton, Pr.G.S., P.A.G. Regr., and W. Bro. Harold Barker, P.A.G.Std.Br.(Eng.); the latter being one of the founders of the Lodge. Greetings were also extended to the many officers present from Provincial Grand Lodge, and also the Worshipful Masters of the Evening Star Lodge and the Murdoch Lodge and brethren.

The Worshipful Master remarked that of the brethren who founded the Lodge twenty-one years ago there was a sufficient number of subscribing members present to fill the various offices. He therefore had very great pleasure in inviting W. Bro. R. G. Shadbolt, P.Pr.G.W., Lincs., to take the chair and conduct the ceremony of initiation, in which he would be assisted by other brethren who were co-founders of the Lodge. The complete list of co-founders acting for the occasion was as follows:

	(Acting)
W. Bro. R. G. Shadbolt, P.Pr.S.G.D., P.Pr.G.W., Lincs.	W.M.
,, Fred J. West, P.Pr.S.G.D., P.Pr.S.G.W.	S.W.
,, William Batt, P.Pr.S.G.D., P.Pr.G.D.C., West Lancs.	J.W.
,, L. B. Taylor, P.Pr.G.D., Staff. (Dudley)	Chaplain
,, J. E. Williams, P.Pr.G.W.	Treasurer
,, J. W. Scott, P.Pr.G.D., Heaton Chapel	Secretary
,, J. W. Broadhead, P.Pr.G.D., West Yorks	D.C.
,, W. Whatmough, P.Pr.G.St.B.	S.D.
,, E. J. Wellens, P.M. (Organist)	J.D.
,, T. W. Jordan, P.M. (Treasurer)	Organist
,, J. Lee, P.Pr.G.D.	I.G.
,, S. Meunier, P.Pr.S.G.D. (Charity Rep.)	Charity Rep.

On the completion of the business of the Lodge, 180 brethren sat down to a banquet presided over by the W.M. (W. Bro. J. Bridge), who, after having honoured the Loyal Toast and those of Grand Lodge and Provincial Grand Lodge, proposed, in appreciative and expressive terms, the toast of "The Founders of the Lodge," which was responded to in an eloquent and fitting manner by W. Bro. R. G. Shadbolt, P.Pr.G.W., Lincs. (the Father of the Lodge). W. Bro. Fred J. West, O.B.E., P.Pr.S.G.W., the Right Honourable the Lord Mayor of Manchester, proposed the toast of "The Visitors," which was acknowledged by W. Bro. Hermann Sheppard (Evening Star Lodge, No. 1719), W. Bro. Col. W. R. Glover, C.M.G., D.S.O. (Murdoch Lodge, No. 3480), W. Bro. R. J. Milbourne, J.P., P.P.G.P. (Salop), and Bro. J. Wilson, President of the North British Association of Gas Managers.

During the evening the toast of "Masonic Charities" was honoured, and the sum of 100 guineas was very quickly raised for the Masonic Institutions.

The W.M. made reference to the fact that of the 39 brethren who founded the Lodge twenty-one years ago—many of them then in the prime of life—there were 23 alive to-day; and out of that number the Lodge had been honoured by the presence of no fewer than 18. To have so many founders present on the twenty-first anniversary was something of which he justly felt very proud and grateful. There did not appear to be within the remembrance of many brethren another twenty-first anniversary celebration at which a ceremony had been conducted by the founders of the Lodge; and it was interesting to know that the candidates initiated on this occasion were Messrs. Rudolph Hyde Duxbury and Norman Hyde Duxbury, sons of Bro. T. Duxbury, of Oldham.

A very fitting complement to the occasion was the rendering, during the evening, of a song "When We Were Twenty-One," written by one of the founders of the Lodge.

A Souvenir.

At the Anniversary Meeting was sold a specially bound edition of "The Landmarks of Masonry," a lecture delivered by the late W. Bro. Race, P.Pv.D.C. of East Lancs. It was beautifully bound in the "Roger Payne" period, and presented to the Lodge by W. Bro. H. S. Knight. The inserted pages of vellum are signed by the Chief Officers of the Provincial Grand Lodge of East Lancs, together with the Founders of the Lodge. It realized £100.

FORTHCOMING ENGAGEMENTS.

Nov. 12.—SOCIETY OF BRITISH GAS INDUSTRIES.—Autumn general meeting at the Hotel Cecil, under the presidency of the Rt. Hon. Sir Alfred Mond, Bart., M.P.

Nov. 12.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Gothic Works, Edmonton, of Messrs. R. & A. Main, Ltd.

Nov. 12.—INSTITUTION OF WELDING ENGINEERS.—Meeting at Caxton Hall, Westminster.

Nov. 18.—SOUTHERN ASSOCIATION.—Meeting at the Hotel Cecil, Strand, W.C. 2, at 2.15 p.m.

Nov. 20.—COKE CONFERENCE, Sheffield.

Nov. 21.—INSTITUTION OF CHEMICAL ENGINEERS.—Meeting at 8 p.m. at the Institution of Mechanical Engineers, Storey's Gate, S.W. Discussion to be opened by the Hon. H. Fletcher Moulton, M.C., on "Scientific Research Workers and Industry."

Nov. 21.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to Kirkintilloch Gas-Works.

Nov. 24.—ASSOCIATIONS OF LOCAL AUTHORITIES.—Session at the Public Works, Roads, and Transport Congress, Royal Agricultural Hall, Islington.—Paper on "The Use of Tar in the Construction of Roadways," by Mr. Thomas Glover and Mr. Arthur E. Collins.

Nov. 25.—EVENING STAR LODGE.—Meeting.

Nov. 26.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Autumn meeting at Birmingham.

Nov. 27.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute.

Nov. 27.—NORTHERN STAR LODGE.—Regular meeting.

Nov. 20.—JUNIOR INSTITUTION OF ENGINEERS.—Meeting at 39, Victoria Street, at 7.30. Lecturette by Mr. G. E. Wells on the "Dehydration of Tar."

Dec. 5.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Visit to Alloa. Paper by Mr. W. Scott.

Dec. 8.—CENTRAL EXECUTIVE BOARD OF THE NATIONAL GAS COUNCIL.—Meeting.

Dec. 8.—FEDERATION OF GAS EMPLOYERS.—Meeting.

Dec. 10.—MURDOCH LODGE.—Meeting.

INSTITUTION OF GAS ENGINEERS.

Nov. 25.—11 a.m., Institution's session at the Public Works, Roads, and Transport Congress, Royal Agricultural Hall, Islington.

Dec. 2.—Official visit to the Shipping Engineering and Machinery Exhibition at Olympia.

Dec. 8.—4 p.m., Advisory Committee on Education.

Dec. 9.—11.30 a.m., Emergency. 12.30 p.m., Finance.

COMPULSORY BENZOLE WASHING IN FRANCE.

In the "Oil News" for Oct. 31, a correspondent writing from Paris, under date of Oct. 23, says the "Journal Officiel" to-day publishes a ministerial arrêté, ruling that the Gennevilliers Works, which supply gas to an important part of the Paris district, shall take steps to extract all benzole from its output. Installation of plant for that purpose is to be completed within two years. Any interruption in total extraction of benzole shall from that date be reported at once to the Office National des Combustibles Liquides and to the War Office. It is expected that, when in full operation, the plant will provide at least 15,000 tons of benzole yearly. Similar decrees are under consideration for other French gas-works. The matter is under the direction of a Special Committee, who were appointed in January last, immediately after the Liquid Fuel Office was brought into legal existence. It may be remembered that in the "JOURNAL" for Sept. 20, 1922, p. 644, we gave information as to new French Gas Legislation on the subject of calorific power; and in the issue for Feb. 14, 1923, p. 389, and Feb. 28, 1923, p. 526, further particulars were given regarding the calorific power basis for gas supply, together with the proposals as to washing for benzole.

New Trench Digger.—A new model of trenching machine brought out by the Parsons Company, of Newton (Iowa), digs 12 in. to 24 in. wide (changing widths by inches), and goes to a maximum depth of 7 ft. The machine will dig within 7½ in. of obstructions such as telephone poles, trees, &c. It can undercut or tunnel under curbs, &c., to connect with main trenches. The over-all dimensions are small, and the machine has a very low centre of gravity that ensures stability and ability to work in cramped quarters. It is mounted on full caterpillars, which are steered by friction clutches.

ELECTRICITY SUPPLY MEMORANDA.

THE electrical journals have been devoting a large amount of space to spreading before their readers the charms of the modern types of electric fires. By words and illustration, they have shown that the range of fires has been considerably extended—not in the vital parts, but in form, casing material, and appearance—design having become more ornate. Generally speaking, there appears to be satisfaction that little more can be done to improve heating elements and to enhance reliability. The old lamp radiators are practically back numbers—nobody wants them, and so nobody makes them. Among the fires, it is noticed that several of the makers have produced types with curved reflector backs; and in some cases the elements are curved, or placed slantwise. Thus by the elements the radiations are directed upwards; by the curved reflector, part is directed downwards. We should imagine that to be scientifically incorrect, and to obtain a satisfactory distribution of heat in a room, the greater part of the radiation should be in the downward direction, with the remainder directed upwards. Heat rises; and therefore it is at the lower portion of the room that the radiant heat is most required to do the work of heating up the animate and inanimate objects, which in turn part with the heat at low temperature to the air of the room. There are a large number of types of electric fires with vertically placed elements; but the most pronounced changes in design are in the direction indicated. Among the new models are noticed hybrid designs—with vertical elements fitted at the bottom, and the top finished off with imitation solid fuel. There is a division of opinion as to the popularity of the bowl type of electric heaters; some makers having apparently had better luck in disposing of them than others. But this form is regarded as useful where there is no heating circuit, or a two-part tariff, and heating has to be done off the lighting circuit. Most makers have also turned their attention to plain-cased 2 and 3 KW. fires of good stability for hiring-out purposes. Another feature in some types is the provision of means for boiling a kettle, by a special element, or by enabling the room-heating element to be turned in an upward direction. The portable type of fire is not very popular—the connecting flexibles being a great drawback, through getting damaged, and people falling over them. As to size, the most popular fires are the 2 KW. ones; but the makers naturally advise that larger and smaller sizes should be kept in stock to suit the varying pocket capacity of customers.

The Heating Season.

The "Electrical Times" has been inquiring of the makers their views regarding the prospects of the electric heater business during the season which has just set in. The general opinion is that appearances are very favourable in comparison with the last two seasons, which were not particularly good for electric fires owing to the mildness of the weather. But those seasons were the best ever experienced for business in gas-fires. Since then there has been intensified propaganda by the electricity industry; many undertakings now have showrooms; and there is the ability of the municipal undertakings to hire-out. These conditions are expected to have good effect. Special window displays and the circulation of literature are advocated. The demand for fires by undertakings and retailers is said to have been good during August and September. Those are the months when we should expect the replenishing of stocks for the business in prospect, not waiting for the time of actual demand before making purchases. However, the makers are optimistic; and they regard the prospects as promising. But we note that one far-seeing contributor deprecates a national electric heating campaign on the ground that a large number of electric supply authorities do not quote prices for heating energy at sufficiently attractive rates. It is, of course, held by the fire makers that the prices of their goods are all right; but they know full well that it is not the initial cost of a fire that is the real drawback—it is the running cost, with 3412 B.Th.U. costing 1d. to (say) 3d. In the depth of winter, a 1 or 2 KW. fire is not effective in warming a fair-sized room; and for continuous heating the cost rapidly accumulates. Thus it is that some of the electric fire makers are of opinion that until there is a general reduction of the price of energy for heating, the demand for fires will continue to be largely regional—that is to say, in those quarters where low prices for heating current prevail. Other than where two-part tariffs obtain, the cost of wiring for heating is also another obstacle. Thus we see the makers of the fires are alive to the fact that the most pronounced hindrance to the electric fire business is the cost of energy and wiring.

Prospects and Prices.

The "Electrical Times" has been blowing a big trumpet over the increase of electric cooker connections to public supply mains. It heads an article "Sharp Rise in the Cooker Load;" and a sub-title proclaims that "cooker connections have increased over 300 p.ct. in two years." The central feature of the article is a curve which shows that between 1912 and 1923 the cooker load increased 100 p.ct. In 1923-24 it advanced another 100 p.ct.; and in 1924-25 it put on 200 p.ct. This we take to mean that the cooking load is 400 p.ct. more than it was in 1912. Having searched the article for the total basic figures on which this curve has been drawn, and having failed to find them, we should be greatly obliged to our contemporary if it would give the opportunity of judging the real value of the percentages by supplying the number of cookers installed in 1912 or in 1923—we do not care which. There would be more sense in doing this than in supplying percentages which convey nothing material as to actual progress. If one cooker was fixed in 1912 and five in March, 1925, that would be an increase of 400 p.ct. We do not suggest anything so absurd as representing the actual circumstances; but a low basic figure makes it very easy to talk in big percentages as to increases obtained by special boosting and new conditions—such as the application of hiring terms. In the course of the article, we see that a point with which we dealt last week is repeated. It is said that figures were tabulated last year relating to some thirty electricity supply undertakings, which showed, among other things, that electricity for cooking is competing successfully with gas where the ratio of the cost of a therm supplied by the two agents is of the order of 5 to 1. We need not again deal with that pretty piece of fiction. If there is equality in the amount of work done in oven and on hotplate, it is impossible for an electric therm costing five times more than a gas therm to perform that work at an equal or lower outlay. Exaggeration has always been a fault of many electrical exponents, and we maintain it is gross hyperbole to claim the 5 to 1 ratio for corresponding amounts of work. It is also pointed out that the electricity undertakings have secured an advantage in developing the cooking and heating load from the fact that, while the price of electricity is descending, the price of gas has ascended. Depend upon it, the gas industry will make that so-called advantage as temporary as possible. Electricity undertakings are urged to adopt the two-part tariff, with a fixed charge, *plus* an "all-in" low running price per unit, as this has been found to have an important bearing on the progress of the cooking load. They are also advised to make the running charge as low as possible, even at the expense of increasing the fixed charge. In other words, dupe or dope the consumers to the greatest extent possible by veiling the actual cost to them per unit consumed.

Cooker Load.

A few definite figures concerning cooker connections are given in the article for certain picked cities and towns. But there is no indication in the data as to the proportion of the cookers which represent compulsory use in housing schemes; and anyway the figures represent a small proportion of the householders connected for electric lighting. We will quote *in extenso* the section of the article supplying the figures:

> Newport, for example, which offers very equitable hiring terms, with total cookers connected now numbering over 1000, secured 718 new consumers last year. Other towns which also did very well include Leicester, with 472 new cooker connections; Liverpool, 493; Manchester, 440; and Preston, 410. Cardiff, also, where 446 cooker orders were booked in the ten days' exhibition held in January, had 410 cookers connected to the mains at the end of the period under review. This has since been increased to over 600 cookers, and further connections are being made at the rate of one a day. Glasgow, with 1461 cookers connected, deserves mention with 375 new consumers secured. Mr. Hardie, it may be recalled, recently stated that in Glasgow they were confident they could easily increase their cooker connections fivefold in two years—but for concern at the very heavy capital expenditure involved. So that the modest little increase of something over 30 p.ct. is almost nothing to what could be done if electric cooker prices were more on an equality with those of gas-stoves. What can be done with enterprise in Glasgow can be effected elsewhere also, which should provide manufacturers with food for thought.

Picked Examples.

But surely our contemporary does not suggest that what Glasgow has done in such a population as is possessed by that city is anything extraordinary—particularly considering that the figure (we imagine) includes the imposition of electric cookers upon the tenants of a number of dwellings erected under the municipal housing scheme; and electricity must have sufficient friends in Glasgow to absorb easily the number of cookers mentioned. Mr. Hardie's confession respecting the heavy capital expenditure involved will help to put on the brake in places less affluent. Maintenance, too, is not a negligible quantity. We recently called attention to the fact that the rental of motors and other apparatus let for hire by the Glasgow Department amounted last financial year to only £4450, whereas repairs of motors and other apparatus let for hire reached the sum of £10,420, while the amount written off motors, cookers, and lamps (10 p.ct.) was £3565. Speaking of the upkeep of the equipment in the municipal houses, Mr. Hardie mentioned that the cost has been found negligible *except in the case of cookers*. Comment is uncalled for. Frankly we are glad that an amount of progress has been made in the electric cooker business, because it will stimulate faster and more effectually than anything else would do the work of modernizing old-established gas-cookers, and bringing them to a better standard of efficiency.

Give the Public the Truth.

The North Wales and Gwynedd Trust appear to be a subsidiary distributing Company of the North Wales Power Company. Anyway the electrical energy which the Company distribute is purchased in bulk from the North Wales Company; and their electrical energy is not different from that distributed elsewhere, and has no more virtue in it. We say this because the Gwynedd Trust are anxious to supply current to Nantwich; and the people there are desirous of seeing that they get the best possible terms. Mr. Evan Davies, Solicitor to the Trust, and Mr. Hublon, the Engineer, have lately addressed a meeting at Nantwich, convened by the local Traders' Association. The ratepayers are of opinion that the charges the Trust are proposing are onerous, compared with the cost of current in other localities—notwithstanding that such a large part of the North Wales supply is generated by water power. The contemplated maximum price is 9d. per unit for lighting, 6d. for public lighting, and 4d. for small power users. It appears that those are the actual charges with which the Trust intend to start; and the people in the district think they are stiff. We agree with them, and on the ground of value for money. In this connection, according to a report of the meeting before us, there were things said which, we submit, were totally misleading to the public. The reporter credits Mr. Hublon with having stated: "For every 6d. spent on gas lighting, the equivalent electric lighting which they proposed providing would cost 1d." Yet later on Mr. Davies—having asked the price of gas at Nantwich, and having been told that it was 5s. 3d.—remarked to Mr. Hublon: "You say 9d. per unit for electricity is equivalent to gas at 4s. 6d." Neither statement can claim to be true; and the remark of Mr. Davies is a contradiction of the one by Mr. Hublon. Let us see what Mr. Hublon's statement amounts to. For 6d. one can buy in Nantwich approximately 100 c.ft. of gas. Using that 100 c.ft. of gas in an inverted gas-burner, it would give 2000 candle-power hours. A pennyworth of electricity at 9d. per unit would be equivalent to 111 watts, which, used in a metallic filament lamp at an efficiency of 1 candle per 1·75 watts, would only give 63 candle-power hours, and sixpennyworth of electricty at 9d. per unit would give 378 candle-power hours. If a gasfilled electric lamp is used, at an efficiency of 1 candle per 0·75 watt, the 1d. would give 148 candle-power hours, and 6d. 888 candle-power hours, compared with the 2000 candle-power hours for 6d. spent on gas. Perhaps Mr. Hublon will withdraw or publicly rectify the statement attributed to him, for, as published, it is distinctly misleading.

Protecting the Public.

The Theatres and Entertainments Committee of the Liverpool Justices have agreed that the cinemas in the city may be opened on the usual conditions on Christmas Day; but at the same time they have warned licensees of cinemas, dance halls, &c., that the Justices in the interests of the public would require all electric wiring and gas fittings to be installed by properly qualified workmen, and not by amateurs. They are quite right in insisting upon this. No one in the gas industry would countenance gas-fitting being done by amateurs; but it is well known that, for decoration purposes at Christmas, electric wiring and lamp extensions are often made by them, and have sometimes produced disaster. The London County Council are very particular about the electric lighting of places of entertainment. Lately, too, the Middlesex County Council issued new wiring regulations; and now, before they will issue a music and dancing licence, stage play licence, or a cinematograph licence, and at every yearly renewal, they demand a certificate from a qualified and independent electrical engineer to the effect that all reasonable precautions have been taken to prevent failure of lighting and risk of fire, and that the Rules of the Institution of Electrical Engineers have been complied with.

"Safety" Items.

Recent electrical fatalities include the death of James Carter, employed at the Broad Oak Print Works, Accrington. He was found in the hot-air chamber of the cleaning department with his neck against the bottom of a portable electric light standard, through which ran two electric wires, carrying 250-volt alternating current. On making tests, conditions were found which justified witnesses in thinking that Carter had received an electric shock. The jury returned a verdict of "Electric shock, or accidental death." Fred Ackroyd was killed on Oct. 23 at Asa Lees & Co., Textile Machinists, of Oldham. On starting an electric-motor, he received a shock, and died immediately. It was stated that the man had been out in the rain, and, his clothes being wet, they probably acted as a conductor. "Death due to Electrocution" was returned by the jury. The danger of having electric wires in the neighbourhood of gas-pipes had recently another exemplification at Swadlincote, Burton-on-Trent. A man struck a match against a tramway standard, when an explosion occurred which blew off the ornamental metal top. The explanation was that the electric wire had fused, and had produced an aperture in a gas-pipe, which caused gas to accumulate in the standard.

Fires and Firemen.

Mr. A. Roberts, the City of London Electrical Engineer, has had a large experience of the wiring conditions in the City. In a letter to the "Electrical Review," he states that there is no doubt in his mind that slip conduit wiring, especially as found in City premises, is a frequent cause of fires. When installed in private surburban houses, it forms a reasonably safe installation, because there is generally room to isolate it from other metal work. But in City premises it is invariably jumbled-up with a mass of lead-covered telephone lines, gas and water pipes, screwed electrical conduit, &c.—all forming, more or less, good earths. He agrees with a remark previously made by the "Review" that "everything depends upon the honesty and skill of the workman;" and a badly-erected "screwed" or "grip fitting" installation is as much a source of danger as any other. But the point is that even the best workman cannot make an electrically sound job of a "slip conduit" system. It seems to Mr. Roberts that the various electricity supply authorities possess the power to raise the standard of wiring. Any company which adopts the I.E.E. rules must refuse to connect any "slip" conduit wiring; and this in course of time will tend to eliminate it. Adverting to the recent death of a fireman in the City through his helmet coming in contact with a live wire, it will be remembered that the jury at the inquest added a rider to their verdict to the effect that the London County Council should take steps to prevent a recurrence of such a fatality by insulating the helmets of firemen. The Fire Brigade Committee have reported that they are advised that it would still be impossible to prevent electric shocks being transmitted to a fireman coming into contact with a live wire while his clothes were wet; and there appear to be no means whereby the possibility of such accidents can be avoided. The risk of electrocution is inseparable from the duties of a fireman.

BOOK REVIEWS.

CHEMISTRY OF POWER PLANT.*

In a small volume containing 130 pages of matter set out in a most readable type there is seldom found such a mass of useful information as this small book—"The Chemistry of Power Plant"—contains. As the author, Mr. W. M. Miles, points out in an introduction which is in keeping with the concise treatment of the subject itself, until recently most theories for the improvement of all forms of steam power plant efficiencies have originated from engineering conceptions; little being known of the benefits to be derived from applied chemistry in this direction. This book is really a survey of this most necessary study from the chemical standpoint. In the past there has been far too little co-operation between the engineer and the chemist; and in many cases the former has regarded the latter from an insecure pedestal. This attitude, however, is neither dignified nor tolerable today; for it is realized that without proper co-ordination of chemical and engineering knowledge plant efficiencies cannot be improved as they should be. This volume, of course, does not attempt to cover a wide field, but it deals excellently with the subjects of coal analysis, combustion, and valuation; the properties and analysis of water; refractories; and transformer and switch insulating oils. The sampling of coal—and much depends on proper procedure in this respect—receives the treatment which the importance of this preliminary step in the analysis of coal warrants. Very wisely no attempt has been made to catalogue the various makes of calorimeter for determining the calorific value of coal. This section of the book commences with the statement that "reliable determinations can only be made on the Mahler bomb or some modification." There will be general agreement with this statement, which is typical of the general tone of this reliable little work. The subject has been dealt with in a practical manner, from actual power plant experience; and the volume will doubtless encourage the co-operation of the engineer and chemist in the furthering of a common aim.

* "The Chemistry of Power Plant," by W. M. Miles. Published by Ernest Benn, Ltd.; price 6s. net.

DESIGN AND ARRANGEMENT OF CHEMICAL PLANT.*

This volume is uniform with that reviewed in the preceding paragraph, and, like "The Chemistry of Power Plant," can be heartily commended. It is written by Dr. Geoffrey Weyman, who, drawing from his considerable practical experience, writes in a most interesting manner. There will be general agreement with the author when he states that far too much chemical plant seen in operation is a confused tangle of pipe work, tanks, and units of different types. There is often lack of definite arrangement, and many of the chief means of control are in inaccessible places. There is a tendency for the technical staff of an undertaking to consider only broad essen-

* "The Design and Arrangement of Chemical Plant in Relation to its Economic Control," by Dr. Geoffrey Weyman, F.I.C. Published by Ernest Benn, Ltd.; price 6s. net.

tials, leaving the detail on which so much depends to plant makers whose main concern is not always the ultimate convenience of the plant. The errors of this system are pointed out in Dr. Weyman's book, which is really an attempt to lessen the gap which exists between the operators and the designers of chemical plant. The volume is divided into six chapters which deal systematically with the question from the preliminary considerations to the arrangement and interconnection of units, and facilities and means of control. Two very important points are emphasized—first, the need for "visualization" or foresight in the design and the arrangement of chemical plant; secondly, that real economy does not depend solely on the efficiency of the whole or of any particular unit of a plant, but on the way in which the plant meets local conditions, and on the general proportioning of the various points and arrangement of detail.

ENGINEERING EXPERIMENTS.*

This book, by H. Threlfall, Engineering Lecturer in the Municipal College of Technology, and in the Victoria University, Manchester, embodies a collection of experiments prepared as an aid to teachers and students in their work on the experimental side of mechanical engineering. It is an extension of the author's book "Experiments in Practical Mechanics," and is carried out on the same general lines. In the fundamental experiments each step is fully described, so that the beginner may know exactly what he is expected to do, and how to do it. Later, as his experience grows, the information given becomes less and less, so that he may be thrown more and more on his own resources. In all there are 192 experiments set out, on the following subjects: Measuring instruments, concurrent co-planar forces, simple structures, concurrent non-planar forces, principles of moments, centre of gravity, specific gravity, work done by a variable force, friction, the inclined plane with friction, simple machines, trains of wheels, simple harmonic motion, moments of inertia, energy of rotation, rolling motion, pendulums, centrifugal force, Atwood's machine, mechanical properties of liquids, Young's modulus, beams, torsion, modulus of rigidity, deflection of springs, and heat and heat engines. It is obvious that a book of this kind cannot be exhaustive, but the wide range of experiments given should be more than sufficient to meet the needs of students preparing for the examinations for the National Certificates, the Institutions of Civil and Mechanical Engineers, and for the intermediate stages of most University courses in engineering.

* "Laboratory Experiments for the Engineering Student." Part I., by H. Threlfall, F.R.C.Sc.I., M.Sc. Published by Chapman & Hall, Ltd.; price 6s. net.

COPPER.*

"A man is likely to go to the poorhouse with a gold mine on his hands, may make a fair living from a silver mine, but easily becomes wealthy when he finds a good copper mine." This is an old mining proverb which is certainly true from an industrial point of view, for copper is one of the most useful metals. Those who wish to have up-to-date information on the copper industry, without desiring a specialized account of any one particular aspect of it, will find this book of great value. It is a survey of the sources from which the metal is obtained, the methods of its manufacture, the nature of its uses, and the conditions of the trade.

* "Copper," by N. E. Crump. Published by William Rider & Son, Ltd.; price 10s. 6d. net.

GAS ENGINE AND GAS PRODUCER TRIALS.

New Standard Codes.

On Thursday, Oct. 29, at the Institution of Civil Engineers, Sir Dugald Clerk, K.B.E., F.R.S., presided at a joint meeting of the various bodies which are co-operating in the work of the Special Committee on Tabulating the Results of Heat Engine Trials. A discussion on the standard codes which have been formulated by the Committee for tabulating the results of gas engines and gas producers was introduced by Mr. G. J. Wells, who said that, like those which have already received consideration at previous joint meetings, the codes are intended to cover two types of trial: (i.) A comprehensive trial for scientific purposes, embodying the fullest information it is possible to obtain from the plant; and (ii.) an industrial trial, in which only the particulars necessary to demonstrate the commercial performance of the plant are given.

The codes formulated by the Committee are accompanied by notes explanatory of such items that require amplification as regards the method used in obtaining the data. The chief aim has been the recording of results in such a form as to facilitate the comparison of trials on plants of different design and capacity.

The codes are arranged in sections symmetrical with those drawn up for other types of heat engines:

1. General information and design data.
2. Methods of measurement employed.
3. Mean observations derived from observations recorded during the tests.
4. Final results deduced from the mean observations.
5. Heat account, in which the heat distribution is summarized and efficiencies are recorded.

For the trials for industrial purposes, only such items as may be required for the immediate purpose are intended to be filled-in, making the test in some cases a comparatively short and simple tabulation. In the comprehensive trial, said Mr. Wells, discretion on the part of the engineer making any trial will be exercised, and many items may possibly be omitted, while additional measurements not included in the codes may be necessary to make the trial complete. The Committee have not attempted to provide for every requirement that may occur in research work, but rather to put forward a framework which will be a safe guide, yielding results in a generally useful form, for use in comparing different designs. In drawing up these codes the Committee have had the assistance of Dr. C. H. Lander, and Messrs. H. R. J. Burstall, W. A. Tookey, H. Hollings, and J. G. King.

In the discussion which followed Mr. Wells' introduction, Mr. N. E. Rambush had a good deal of constructive criticism to offer on the gas producer code. Being more particularly concerned with the manufacture and design of gas producers, he confined his remarks to this section. He thinks that the Institution of Civil Engineers should lay down a definition of fuel depth—whether it is the maximum, minimum, or average distance between the air slots and levels of the fire—and suggests that when particulars are being given of the producer grate, it would be a good idea to include the average sectional area of the producer throughout the whole of the fuel bed. Regarding the trial itself, Mr. Rambush remarked that, as the load factor of a producer has an important bearing upon its operating results and efficiency, testing particulars should include statements as to the momentary and average load. If possible, a load curve should be furnished. The duration of a gas producer trial has a very important bearing upon the results obtained, and in the opinion of Mr. Rambush it is not possible to make a proper performance test on most gas producers in the short periods usual on steam boiler trials. With many producers more than 8 hours expire between ashing periods, and it is very difficult to determine whether the fuel bed at the end of a short duration test is in the same state as at the beginning. He once found it necessary to run tests extending for as long as 30 days, night and day, to obtain anything like correct results; and consequently he suggests that the Committee should emphasize the desirability of a long duration test. In the code it is stated that the temperature of the ashes discharged can generally be taken as 2000° Fahr. To Mr. Rambush this appears inadvisable, for in many plants the ashes are cooled by the upgoing air and steam, and leave the plant at a temperature very much lower than the figure mentioned. He also suggests that the Committee should lay down a standard system and method for the analysis of producer gas, and in particular warn against the ways of error. It would be excellent if a standard basis of estimating the heating value of the gas from each component could be stated in detail, as varying figures are being employed in practice. On both these points Mr. Hollings is in agreement. He mentioned that the Committee are at present considering the standardization of methods of gas analysis. The foregoing items from the valuable criticism which Mr. Rambush made are by no means exhaustive, but they are those of a more general nature.

The only other item of general interest discussed at the meeting was the old "snag" of gross and net calorific values. Mr. Lymn was all for net values; but Sir Dugald Clerk remarked that, though it was usually impossible to recover the latent heat in (say) the exhaust of a gas engine, the gross value basis was the only one scientifically sound. If it was possible to utilize the latent heat, and this utilization was taken into account when assessing the efficiency of a plant based on the net calorific value of the fuel, the figure for efficiency obtained would be fictitious. Mr. Wells also had a word or two to say on this point. It was very necessary, he said, that the calorific value of a fuel should be measured as accurately as possible; and it was far easier to determine the gross value than the net value. Based on the net value of the fuel employed, the figure for engine efficiency would be higher than if based on the gross value; but the lower figure was absolute, and placed no imputation on the skill of the designer. Mr. Rambush suggested that, if the Committee insisted on the gross value being used in ordinary testing, they should recommend that the net value be given as an addition, to enable a proper comparison to be made of the value of the gases from the buyer's point of view. There was, he said, a further point to bear in mind. When the thermal intensity—or, as it was sometimes called, the theoretical flame temperature—was calculated from the analysis of a gas and of its products of combustion, it would not be possible to use the gross heating value unless careful adjustments were made in the calculations. When the net value was employed, such adjustments were unnecessary.

OPENING OF THE GAS LIGHT AND COKE COMPANY'S NEW SHOWROOMS IN ISLINGTON.

The Union of Art and Utility.

The Seven Sisters Road, in Islington, could not be described as one of London's most fascinating thoroughfares, but distinction and attraction have recently been lent by the erection of a most dignified building, to serve as a showroom, district office, fitters' depôt, and stores, by the Gas Light and Coke Company. There are now three structures of note in the neighbourhood—as Mr. Milne Watson jokingly remarked, at the opening of the last-named—the Prison, the Town Hall, and the Gas Company's Showrooms!

Expanding Demands of the District.

The new building (for the design and arrangement of which Mr. H. Austen Hall, F.R.I.B.A., who planned and designed the famous Gas Exhibit which achieved such success at Wembley, was responsible) is the outcome of a desire on the part of the Company to give better facilities and efficient service to some 62,000 of their customers in Islington, St. Pancras, Hornsey, and Stoke Newington. With these new premises they will be able more satisfactorily to cope with the rapid expansion of their business in those districts. It will undoubtedly prove a great convenience to the large population in the area in which the new building is situated to have there a district establishment of the Company at which they can get attention to their every want. During the past twenty years the consumers in the area to be served by the new depôt have increased in number from 41,150 to 62,480, and the demand for gas fittings and appliances has increased much more than proportionately to the number of consumers, so that the need for this addition to the Company's means for serving the public had become urgent.

At the Seven Sisters Road showroom the public will find—as the gathering of local celebrities found on the opening day—a large selection of artistic lighting fittings, efficient gas cooking appliances of all descriptions, fires to suit every style of furnishing and decoration, geysers, hot-water circulators, wash coppers, and numerous other labour-saving appliances. The housewives of the district will also have frequent opportunity of attending practical lectures and demonstrations in economical gas cookery by members of the Company's staff of expert women advisers on domestic economy. For this purpose a comfortable lecture-room has been provided.

Opening Ceremony.

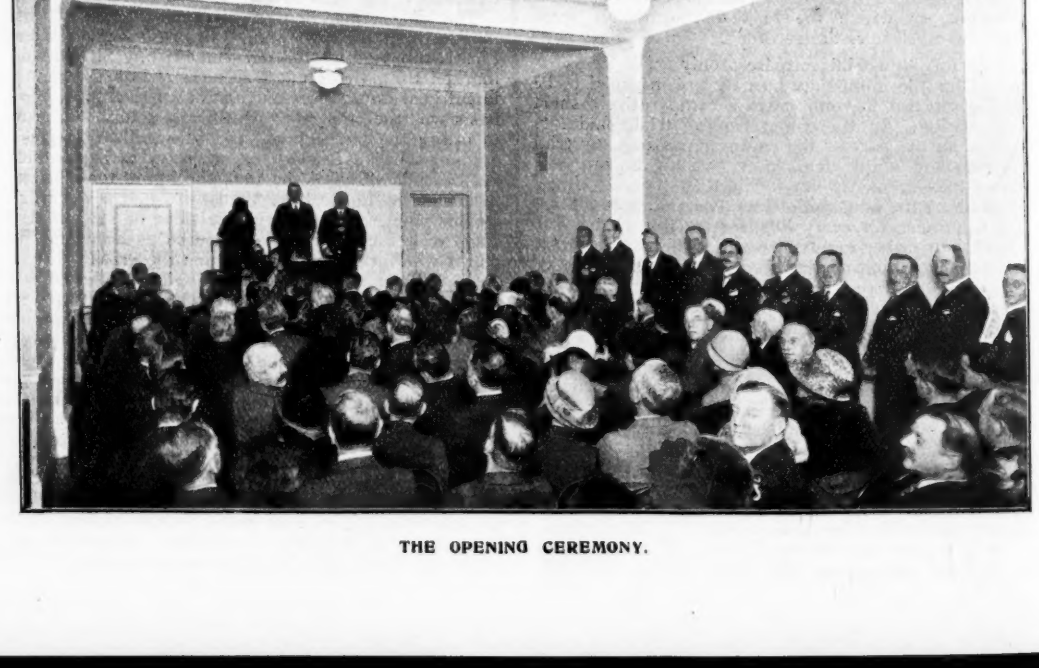
The opening ceremony was performed last Thursday afternoon by His Worship the Mayor of Islington (Councillor Sidney C. Harper, J.P.), who was accompanied by the Mayoress, and was supported by many of the Aldermen, Councillors, and principal officers of Islington, St. Pancras, Stoke Newington, and Hornsey, as well as leading members of the Islington and St. Pancras Chambers of Commerce.

The visitors were welcomed by the Governor of the Company, Mr. D. Milne Watson, D.L., and other members of the Court of Directors. With the Directors there were the Assistant General Manager (Mr. R. W. Foot), the Secretary (Mr. W. L. Galbraith), the Chief Engineer (Mr. T. Hardie), the Accountant (Mr. H. E. Ibbs), the Rental Superintendent (Mr. L. M. Simmons), the Chief Officer of Stores (Mr. W. M. McDowall), as well as the Controller of Gas Sales (Mr. F. W. Goodenough), the Deputy-Controller (Mr. Stephen Lacey), and the Senior Officers and representatives of all grades in the Gas Sales Department.

Mr. Milne Watson remarked that, before he asked His Worship the Mayor formally to declare the new showrooms open, he would like to say a few words about these premises. Some time ago they realized the necessity for new showrooms in the area, and had accordingly erected the present building, which, he thought, all would agree reflected great credit on the architect responsible for the design and arrangement, Mr. H. Austen Hall, and on Mr. W. J. Tapper, who carried out the decoration and furnishing of the showrooms. He would say that the Gas Light and Coke Company were pleased to extend in this direction, in order to give better facilities to their 62,500 consumers in the area—a number which had grown from 42,000 in the last few years—and to enable the business to be dealt with more expeditiously. In the new scheme they had not forgotten the well-being of the workmen, for whom excellent accommodation had been provided. The chief object of the new showrooms was, of course, to attract the public by a display of what gas could do in the way of lighting, heating, and cooking; and he thought that all present would readily agree that this display had been well planned. Nowadays, for a business or an industry not to go forward was to go backwards; and it was necessary that the people of the neighbourhood should have placed before them some demonstration of the capabilities of gas, to enable them to realize that gas could be used in the most artistic surroundings. If they were able to demonstrate this fact to the inhabitants of that important area, then the expense in erecting the new building would be amply repaid. The gas industry, though old—the Gas Light and Coke Company was founded in 1812, more than 110 years ago—was still going strong, and it had done a great deal of good work in promoting comfort and rendering the lives of those who lived in towns better and healthier. In late years the enormously extended use of gas had brought about a marked increase in the amount of effective sunshine—in some cases as much as 50 p.ct.—through the very considerable decrease of the soot in the atmosphere. He hoped that this good work would continue until Islington became entirely smokeless. [Hear, hear.] He was speaking to a large and representative gathering of people in the district, among whom were members of the Councils of Islington, Hornsey, St. Pancras, and Stoke Newington, who, no doubt, were interested in the development of electricity. Well, he thought that gas and electricity, for both of which there was ample room in the service of the nation, could go forward together having a common aim—that of making these boroughs smokeless. Mr. Milne Watson concluded his remarks by offering a hearty welcome to the Mayor of Islington.

A Small Replica of the Wembley Gas Exhibit.

The Mayor of Islington said that he esteemed it a great honour to be asked to declare the new showrooms open. Islington took a keen interest in the commercial development of the Gas Light and Coke Company, who lighted 3000 of the



THE OPENING CEREMONY.

public street lamps, and were not by any means among the smallest ratepayers. They were in the real sense of the term a public utility undertaking, for they not only sold gas, they also gave service. He was very pleased to see the new building, which was to be used not only for helping directly in the sales of gas, but also for explaining to the public how they could employ it to the best advantage, for the room in which they were assembled that afternoon was to be devoted to cookery lectures. The housewives of the district would doubtless appreciate this. The showrooms themselves seemed to be a small replica of the Wembley Gas Exhibit—an exhibit which had enabled millions of people to see the extraordinary development of the gas industry. Among those he was addressing were several members of electricity committees. As Mr. Milne Watson had said, there was plenty of room for both gas and electricity, and healthy competition was a good thing. The Gas Light and Coke Company were an ideal corporation, because, by reason of the sliding-scale, they could not over-charge for the gas they supplied. Before concluding, he would like to refer to the opportunity which was recently afforded the public men in the district of visiting the Beckton Station of the Company. Those who were able to visit these works were certainly delighted with the information which they had received about the manufacture of gas. He had great pleasure in formally declaring the new showrooms open; and he hoped the Gas Light and Coke Company would secure the business which they had gone out for in such an enterprising manner.

After the opening ceremony tea was served in the large general office, following which the visitors made a tour of inspection of the showrooms, offices, and stores.

The New Showrooms.

The showrooms have an imposing frontage on the Hornsey Road and the Seven Sisters Road; and the aim throughout the whole lay-out of the showrooms has been to sectionalize the exhibits so that, regarding any particular display, attention is not diverted by the close proximity of others. This is an admirable idea, and the manner in which it is carried out is worthy of the highest praise. As they appeared on the opening day, the window displays comprised a bathroom, a kitchen, a dining room, and night and day nurseries. In each case the effectiveness and uniformity of the settings showed what care and skill had been exercised. The exterior of the building is lighted by Keith high-pressure lamps of 1000-c.p.; a Keith rotary compressor coupled to a 4½ B.H.P. "National" gas engine providing the necessary pressure.

The decoration and furnishing of the showrooms were carried out by Mr. W. J. Tapper, F.R.I.B.A., and are in perfect taste. The lighting is by Sugg's ventilating lamps supplemented by bracket fittings, and all lights are switch-controlled—a feature which was the subject of much favourable comment on Thursday last. In the main entrance hall is the cashiers' department, and at one end is a desk for general showroom inquiries, and at the other a desk where complaints are received. Leading off from the entrance hall are two charmingly-equipped waiting rooms where those who have special inquiries to make, or who, perhaps, desire to see a particular representative of the Company, are taken. These are not merely waiting rooms in the ordinary sense, but are so fitted up as to give a delightful impression of the harmony of effect of gas heating, and how well it satisfies all the tenets of good taste. Another of the smaller rooms is devoted to gas fittings, which, being separately dealt with in this way, do not confuse or mar the general dignified tone of the entrance hall or other sections of the showrooms. In spite of this sectionalization, there is a delightful continuity about the showrooms. One passes from a room where large apparatus for the hotel or restaurant is exhibited to another which deals with domestic cooking, and then to a further section where hot-water appliances heated by gas and by coke are set out in an arrestingly simple and striking manner. Indeed, anyone who wishes to see a remarkably fine example of how a simple and highly effective solution has been found to the complex problem of gas appliance display should certainly pay a visit to these new showrooms of the Gas Light and Coke Company.

On the first floor of the building are to be found the general office, the staff dining room and kitchen, and a comfortable lecture theatre—all excellently arranged and equipped. On the mezzanine floor are the fitters' lobby, the foremen's offices, and the staff lavatories. The premises also include a commodious stores, which in lay-out, detailed arrangement, and efficiency of operation is a model well worthy of study; a small workshop; and a distribution and service layers' depôt for the district. Before concluding these few notes, attention may well be drawn to the system of general heating which is employed. This consists of a Spencer-Bonecourt gas-fired boiler which supplies hot water, at a temperature which can be regulated at will according to weather conditions, to the different radiators.

The Gas Sales Department of the Company, to which is entrusted the task of giving good service to the 950,000 consumers in their area, are, of course, responsible for the administration of the new district centre, which will be under the immediate charge of Mr. A. H. Webber as Local Manager, who has been transferred from the Company's Camden Road Office. Mr. Webber is at present the Chairman of the St. Pancras Chamber of Commerce.

THE SHEFFIELD COKE CONFERENCE.

Friday, Nov. 20.

The Conference on Solid Smokeless Fuel, to be held in Sheffield on Friday, Nov. 20, promises to be a great success. It has been arranged under the joint auspices of the Society of Chemical Industry (Chemical Engineering Group and Yorkshire Section), the Institution of Chemical Engineers, the Institution of Gas Engineers, and the Midland Institute of Mining Engineers. On the occasion the papers read at the conference in Leeds in July will be further discussed, together with the chief winning papers in the Coke Competition. The conference will (by kind permission of the Council of the University) take place in the Mappin Hall of the University, St. George's Square, Sheffield. The morning session will be from 10 a.m. to noon, from which time to 3 o'clock there will be a demonstration of coke-burning apparatus. The afternoon session will be from 3 to 5.30. Dr. W. Ripper, J.P., will open the meeting and introduce the Chairman, Sir Arthur Duckham, K.C.B.

Many prominent men in the carbonizing and chemical industries will support the Chairman on the platform. The gas industry will be represented by Mr. D. Milne Watson, President of the National Gas Council, Mr. C. F. Botley, President of the Institution of Gas Engineers, Mr. R. Halkett, Prof. Cobb, Mr. E. V. Evans, Mr. E. W. L. Nicol, Mr. Douglas Rider, and Mr. F. M. Birks. Among others will be Mr. W. J. U. Woolcock, President of the Society of Chemical Industry, Sir Frederic Nathan, K.B.E., President of the Institution of Chemical Engineers, Mr. T. Biddulph Smith, President of the Coke-Oven Managers' Association, Prof. J. S. Haldane, Dr. C. H. Lander, Director of Fuel Research, Mr. C. S. Garland, Chairman of the Chemical Engineering Group, Sir Robert Hadfield, Col. H. K. Stephenson, Chairman of the Sheffield Gas Company, Prof. R. V. Wheeler, Prof. W. A. Bone, Mr. E. C. Evans, Mr. F. S. Sinnatt, and Dr. Margaret Fishenden.

The foregoing names alone indicate the importance of the occasion; the material which will be presented for discussion accentuates the indication.

The Leeds Papers.

The papers read in Leeds on July 16, 1925, were:

(*a*) "Smokeless Fuel: The Present Position and Future Possibilities." By C. H. Lander, D.Sc. (Director of Fuel Research under the Department of Scientific and Industrial Research), and Margaret Fishenden, D.Sc. (of the Westminster Technical Institute).

(*b*) "Solid Smokeless Fuels: Their Production, Properties, and Use." By Edgar C. Evans, B.Sc., F.I.C., National Federation of Iron and Steel Manufacturers.

(*c*) "A Study of the Tars and Oils Obtained from Coal." By F. S. Sinnatt, M.B.E., M.Sc. (Tech. Mech.), F.I.C., M.I.Min.E. (Assistant Director of the Fuel Research Board), and J. G. King, B.Sc., F.I.C. (Chief Chemist to the Fuel Research Station).

Coke Competition Papers.

In addition to the further discussion of the "Leeds Papers," three of the principal winning papers in the Coke Competition recently organized by the "Gas Journal" will be discussed.

The winning papers are:

(*d*) "Coke Production," by the Research Section of the Woodall-Duckham Companies, London.

(*e*) "Coke Preparation," by Falconer M. Birks, London.

(*f*) "Coke Utilization," by F. H. Arms, Birmingham.

These papers have been published with nine others in a special number of the "Gas Journal." Copies can be obtained either from the "Journal" Office, or from the Hon. Secretary, Chemical Engineering Group, 307, Abbey House, London, S.W. 1, at the price of 1s. 3d. post free. Reprints of both the "Leeds Papers" and the "Coke Competition Papers" are obtainable from the Hon. Secretary, Chemical Engineering Group, at 2s. 6d., post free.

Openings and Discussions.

The following gentlemen will deal with the subjects specified:

(1) Dr. C. H. Lander . . .	General résumé of Papers (*a*) and (*b*).
(2) Dr. E W. Smith	The Qualities Requisite in a Solid Smokeless Fuel for Domestic Use.
(3) Prof. R. V. Wheeler . .	The Production of Free-Burning Solid Smokeless Fuel at High Temperatures.
(4) Mr E. V. Evans . . .	Combustibility and Reactivity of Coke.
(5) Mr. Douglas Rider . . .	Coke Quenching.
(6) Mr. F. M. Birks	Coke Handling, Screening, and Breaking.

All who wish to take part in the discussion are asked to give their names to the Hon. Secretary or to one of the Stewards before or during the sessions of the meeting.

Admission to the Meetings.

Admission to the meetings will be by ticket only, which will be supplied to all members of the Institutions and Societies concerned. Any further tickets of admission can be obtained by applying to the Hon. Secretary, Chemical Engineering Group, 307, Abbey House, London, S.W. 1.

FUEL RESEARCH BOARD REPORT.

A report of the Fuel Research Board of the Department of Scientific and Industrial Research for the period ended Dec. 31, 1924 (the last general report on the activities of the Department in connection with fuel research was published early in 1920), has been issued by His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C., at the price of 1s. 6d. net. It is in two sections—the first bearing the signature of Sir Richard T. Threlfall, K.B.E., F.R.S., the Chairman of the Board; and the second being the report of Dr. C. H. Lander, M.Inst.C.E., Director of Fuel Research.

The report of the Board is the first issued since Sir George Beilby resigned his position as Chairman and Director of Research; and the Board place on record their sense of the loss sustained, first by his resignation in May, 1923, and then by his death on Aug. 1, 1924. The Fuel Research Station, they add, is a lasting memorial to his informed imagination and foresight; and in the programme of work laid down under his guidance, his colleagues and successors have found a solid foundation for their operations up to the present time. By 1923 a position had been reached when much of the Board's preliminary work, and even of the Fuel Research Station itself, would have been lost if the investigations had not been continued on a large scale. Accordingly, on the recommendation of the Advisory Council for Scientific and Industrial Research, increased provision was made for fuel research in the estimates for the financial year 1924-25, and authority was given for a gradual expansion of the staff of the Fuel Research Station. It was at this stage that an increase was made in the Board, and Dr. C. H. Lander was appointed as Director of Fuel Research. With the object of providing both liquid fuels and solid smokeless fuel, the Board initiated a number of investigations, which are still being pursued, into the carbonization of coal at temperatures suitable for those purposes. Apart from experiments on individual designs, the work of the Fuel Research Station has done much to ascertain the processes through which coals are carbonized and the real structure of coke. Methods have been developed by which the results of laboratory examination can be made more significant; and a control has been established over carbonization on a technical scale which for the first time approaches the order of accuracy required in a laboratory. By a recent decision, the Department now also undertake the test of approved industrial plants without charge for the services of their officers, on terms set out in an appendix.

In addition to studying theory and methods, the Board have made, erected, and tested certain typical designs of retorts, with such modifications as seemed desirable. By collating the experience thus obtained, a simple continuous vertical retort has now been elaborated, which is working smoothly and producing tar and coke at low temperatures, while the labour required to run the plant is reduced to an amount comparable with ordinary gas-works practice. Though, however, this plant appears very hopeful, a definite opinion cannot be formed on its industrial value until it has been working steadily for a long period. In a comprehensive report on low-temperature carbonization published in 1922, the Board expressed the opinion that the available data were not then sufficient to decide whether it would be possible to establish on sound industrial lines a new industry based on the carbonization of the tens of millions of tons of coal that were being burnt every year in the raw state. The work done since that date shows a definite advance; but even now the question formulated in the earlier report cannot be answered finally.

By the Gas Regulation Act, gas authorities were allowed much greater freedom in the composition of their gas, in consideration of basing their charges on its actual heating value. The passage of this Act was a natural occasion for seeking increased economies in the manufacture of gas; and during the preliminary inquiries the Board's attention was drawn to the special need for accurate data on a technical scale with respect to the effect of introducing steam into vertical retorts. By the erection and working of a setting of these retorts so designed and equipped as to allow accurate control and measurements of the process and its products, the staff of the Fuel Research Station have been able to obtain results that have been of material assistance in the industry. In particular, a method has been elaborated by which sample consignments of individual coals can be examined for their behaviour during carbonization with any desired percentages of steam in strictly comparable conditions; and the facility for making such examinations has been of service to both coal owners and users. A recent investigation has shown the possibility of enriching gas made in vertical retorts by injecting oil and cracking it into permanent gas, in this way allowing the volume of gas to be increased in emergency by increased steaming, without sacrificing its calorific value. The investigation is being continued, with the object of simplifying the apparatus at present used.

In another direction, the Board have recommended—and the recommendation has been approved—that a bench of horizontal retorts, similar to those in use in gas-works, should be erected at the Fuel Research Station, with the two-fold object of investigating the working of the retorts and of providing a plant in which the behaviour of individual coals can be tested, when such tests are required for the work of physical and chemical survey. Arrangements have also been made to instal at the Fuel Research Station plants for washing and purifying coal, which will be representative of the different methods in use, and will assist the staff to determine the most suitable treatment for any given coal—a problem that will continually arise as the survey of the coal seams now in hand proceeds. Attention is drawn by the Board to the fact that the methods used in the sampling and analysis of coal for the purposes of this survey are of great importance; and this is equally important where coal is bought and sold to a specification. The Board in 1921 appointed a Committee to deal with this matter; and a report on methods of analysis has been issued. The work that is necessary before a report on sampling can be published is still in progress.

DR. LANDER'S REPORT.

Much other work is in hand, all of which, together with the special branches which have been touched upon here, is dealt with fully in the report of Dr. Lander, as Director of Fuel Research. He includes in this report a history of the organization of the Fuel Research Board and the Fuel Research Station and a summary of the whole of the work carried out, as well as the account of the work in hand and projected. Owing to the increased volume of work now undertaken at the Fuel Research Station and elsewhere, it is intended in future to prepare an annual report of the work on fuel research. A useful appendix to the present report is that which contains a full list of the Department's publications on fuel research, and of papers describing researches on fuel that have been assisted by the Department; and another appendix gives a list of the staff employed and members of Committees appointed. A plan of the Fuel Research Station at East Greenwich and a series of photographs are included in the report.

An outline is given by Dr. Lander of the nature of the investigation undertaken in connection with the physical and chemical survey of the national coal resources; and he follows this with a notice of the work undertaken with reference to the gas industry. As to steaming in gas retorts, he says that the work already accomplished in this direction is sufficient to show the advantages and disadvantages of steaming, as the range of coals investigated is now probably wide enough to cover all typical gas coals. Further investigations of this nature will be made on coals from particular seams in connection with the work of the survey. The work leading up to the recently issued report on the production of gas of high calorific value in vertical retorts, by injecting oil (see the "JOURNAL" for Oct. 7 last, p. 37), is indicated. Mention is made of the following other ways in which it has been found possible, with a Durham gas coal, to increase the calorific value of the gas produced in vertical retorts with steaming:

(1) A comparatively low carbonizing temperature, with higher temperatures towards the bottom of the retorts, to remove volatile matter from the coke.
(2) The restriction of the steam used to the least that will create enough pressure in the coke chamber to exclude air and prevent overheating, and its injection at the lowest possible point.
(3) Arrangements for increased cracking of the liquid hydrocarbons, and the omission of condensed tar in the collecting main, so running the main dry and preventing the scrubbing action of the tar on the gas.

There has been a series of experiments on one coal to determine whether, either thermally or by an increased yield of ammonia, any material advantage can be gained by introducing air during carbonization. It was found that, with 20 p.ct. of steam, 5 p.ct. of air reduced the heat required per ton of coal as fuel by 1·4 therms, and increased the yield of gas from 17,900 to 18,900 c.ft., but at the expense of a reduction in calorific value of 25 B.Th.U. per cubic foot in the gas made, in addition to the coke consumed in the retort. The yield of ammonia was not increased.

Reference is made to an exploration of the interior of vertical retorts, and also to heat losses from them. When in 1922 it became necessary to re-line the retorts, the opportunity was taken to remove the cast-iron linings and shutters of the sight-holes of the retorts, and to replace them by fireclay plugs. The result was a very striking reduction in the heat lost from the setting, which showed a saving of about 3 therms per hour in the gas used for heating the setting of four retorts, or some 7 therms per ton of coal carbonized. This, says Dr. Lander, typifies some of the economies that might be effected in practice, were greater attention paid to insulation and generally to the reduction of heat losses by radiation, &c.

Next there is an epitome of the work done in connection with water gas manufacture. All varieties of coke produced at the Research Station as the result of large-scale carbonization experiments are tried in the water gas plant to ascertain their suitability for water gas manufacture. The separate producer plant, provided primarily to run the gas engines, is also used as a test apparatus. These trials have brought out the extent of the differences that exist in gas cokes—differences which may be due partly to the structure of the coke and its reactivity,

but are caused mainly by variations in the nature and amount of the contained ash. The effect of the ash and clinker on the refractory linings of the generator is being studied.

There is a lengthy section devoted to low-temperature carbonization, in the course of which Dr. Lander points out that the difficulties which have to be overcome in this process of carbonizing coal are greater than those where high temperatures may be used. When, moreover, low-temperature carbonization is considered as a possible means to an end of national importance, the successful solution of its problems must include methods for dealing with a range of coals that differ widely in composition and character. A single process will doubtless not be the best for every type of coal. Cost is also a matter of the first importance; any process that is to succeed must involve a minimum both of capital and of working charges. There is a diagram of the continuous low-temperature retort installation at the Research Station.

The work done on briquetting by carbonization is described; and the products of low-temperature carbonization are discussed. Other matters dealt with are steam raising, CO_2 recorders, pulverized fuel, internal combustion engines, power alcohol, peat, domestic heating, laboratory and small-scale work at the Research Station, and miscellaneous work.

INDUSTRIAL APPLICATIONS OF COAL-TAR PRODUCTS.*

The claim put forward for this recently-published book is important and attractive: "The present work draws the attention of manufacturers, chemists, tar distillers, &c., to the full range of materials which have been isolated from coal tar. It describes their preparation, tabulates their uses and potential uses, suggests alternative and more efficient processes, and generally makes known the full possibilities of the coal-tar products—crude, intermediate, and refined—in a way never previously attempted within the compass of one volume." In other words, the treatise purports to bridge the gulf separating the published information regarding the production and distillation of coal tar on the one hand and the chemistry and application of the final fine products on the other.

The aim of the authors is professedly to answer the query, "How is such and such a product obtained, and what are its uses?"

They further state: "In order to keep the book within reasonable limits, we have found it impracticable, in most cases, to do more than outline the methods of manufacture." This being so, and having regard to the title of the book, it is surprising and very disappointing to find a large proportion of the pages filled with the graphic or constitutional formulæ of the numerous derivatives of coal tar.

It appears to the reviewer that far too much space is thus allotted to the chemistry of the subject, with the resulting sacrifice of the information one is seeking—namely, "the industrial application of coal-tar products." What the authors have written about the latter would not make up an imposing book; and as they appear to be well informed on the subject, this is to be regretted.

It is realized, of course, that a considerable amount of overlapping instruction is inevitable in making a bridge between two subjects, but one cannot very well see how one of the authors (A. Davidson) can write his treatise on "Intermediates for Dyestuffs" (to be published next spring) without plain repetition of a great deal of the matter contained in the book under review.

Though one believes, from the student's point of view, in the advisability of reading as many books as possible on the same subject, so as to take advantage of different methods of exposition, yet in this case the authors would have been well advised if they had got promptly to business, and presented in compact form what they set out to communicate. To give an example of what is meant, surely it would have been better to cut out, at any rate after its first representation, the bulky graphic formulæ for ortho, meta, and para derivatives of the various aromatic hydrocarbons. Even a somewhat complex derivative such as H acid is quite clearly described as 1 : 8 aminonaphthol 3 : 6 disulphonic acid, without having recourse to the diagrammatic symbolism which takes up so much space.

Taken chapter by chapter, the derivatives of benzene, aniline, toluene, xylene, naphthalene, beta-naphthol, phthalic anhydride, anthracene, pyridine and carbazole, acenaphthene and phenanthrene, phenol, salicylic acid, and cresol are expounded with special regard to their applications for dyestuffs, pharmaceutical products, explosives and poison gases, perfumery, synthetic resins, photographic material, &c.

Naturally the subject of dyestuffs—now fortunately one of great and growing importance in the development of the chemical industry of our country—occupies a predominant place in the text. Where commercial data are lacking, the authors furnish many useful theoretical considerations and the laboratory steps necessary for the ultimate attainment of the final pure product in question. The steadily-growing perfumery industry is accorded a fair share of attention, while the more important industry of pharmaceutical products is adequately dealt with.

It is evident that the work is up-to-date and gives valuable information on recent developments connected with the production of pharmaceutical products and fine chemicals generally, and it will no doubt be acknowledged on all hands that the authors have made a close study of the most modern methods of organic chemistry.

The last chapter in the book is entitled "The Crude Products," and is of great importance, dealing, as it does, with road tars, disinfectants, and preservatives, creosoting of timber, motor and other fuels, synthetic resins, solvents, synthetic tannins, paints and varnishes, &c. There are only 25 pages in this chapter, which, it is thought, constitutes the essential subject matter of the book as indicated by its title; and one cannot help noticing that the authors are not so well informed thereon as they ought to be, both from a commercial and from a technical point of view. They might have shown more discrimination in the quotation of such items as the composition of tar, and the comparison of benzole and petrol as motor fuels, and should have greatly amplified the discussion of this part of the subject. How ridiculous, too, to quote the figures of the Automobile Association of a motor car mileage of 1739·013 per gallon of lubricating oil (page 255)!

There are many things elucidated in this book which one did not expect to find; on the other hand, there are many matters of commercial and industrial importance that are either lacking or merely mentioned. A few of the latter may be briefly stated:

Competitive sources of primary and intermediate products of coal tar. Quantities of primary and intermediate products made and used in the various industries, and the possible outlet and output. Information regarding disinfectants, sheep dip, and the like. An account of primary tar (true low-temperature tar), its composition and possible uses. The "cracking" of tar and tar oils. The manufacture and uses of different grades of cresylic acid. The manufacture of bakelite and other insulating compounds.

While the diction and punctuation are often very loose, the text is racy, and forms interesting reading which is not at all tiresome. There has been pleasure in reading the volume, but one expected something more from a two-guinea book on the "Industrial Applications of Coal Tar Products" than was actually found.

* "The Industrial Application of Coal-Tar Products," by H. M. Bunbury and A. Davidson. Published by Ernest Benn, Ltd.; price 42s. net.

The "Gasoscope."

A gas leak finder called the "Gasoscope," marketed by the Alpha-Lux Company, of No. 192, Front Street, New York (and bearing on the dial the name of Prof. Dr. Strache, Vienna), is a simple device to locate an escape by indicating the presence of gas in the air.

The main feature of its mechanism is a cell, closed at the bottom with a porous plate to permit the diffusion of the gas into the cell. The gas from the suspected air on entering this cell will create a pressure in proportion to the percentage of gas in the air. The pressure thus created acts upon a metal diaphragm similar to that in the aneroid barometer. The expansion of the diaphragm due to this presence is recorded, or rather indicated, on a graduated dial or face by a hand moving to the left as the pressure in the cell increases. The cell has, at the centre of the porous disc, a conical valve to permit communication of the interior of the cell with the atmosphere. In operating the device, one first closes the valve at the bottom by turning the lower section of the tube (this valve should always be kept open when the instrument is not in use). The hand is next set to zero by moving the dial. The apparatus is then brought into communication with the suspected air; and if this contains any gas at all, the hand will move to the left. Therefore, to find a leak the instrument is passed along the suspected pipe or appliance until a maximum of deflection is reached indicating the point of escape. The tests are instantaneous, and nothing is gained by prolonged exposure.

Water Gas Tar for Exterminating Chinch Bugs.—It is stated by Mr. Carl B. Wyckoff, President of the Emporia Gas Company of Kansas, that water gas tar has been found effective by the Kansas State Agricultural College in exterminating chinch bugs, which cause an enormous loss to farmers every year. By the use of this tar spread as a barrier in front of the fields of growing corn, the farmers of Kansas have scored a signal victory over one of agriculture's most destructive enemies. For the first time in the history of the State the migration of the bugs has been stopped; and the tar is largely responsible for their defeat. The success of this method of fighting chinch bugs is most important to the agricultural States; for it virtually means that chinch bugs can be controlled by the farmer with a little effort and a small expense.

UNIVERSALITY OF THE HORIZONTAL RETORT.

By H. J. TOOGOOD, of Messrs. Robert Dempster & Sons, Ltd.

Doomed patients live long, and so with horizontal retorting, since for the past twenty years the horizontal retort has been prophesied as on the point of extinction, yet to-day this principle in its modernized form is finding more adherents than ever before.

The factors which are responsible for this continued success are :

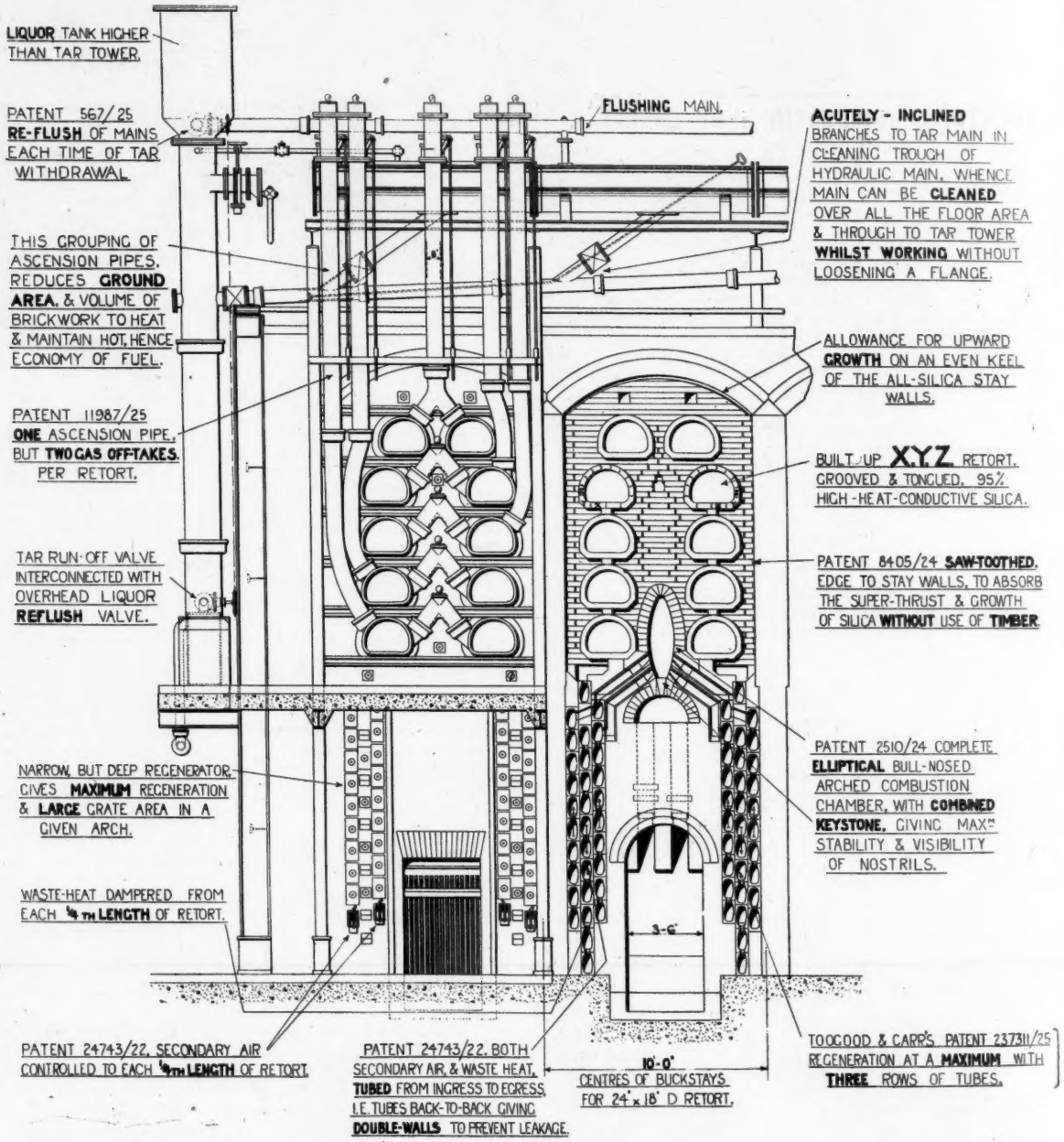
(1) Developments which have come from within the gas industry.

(2) Manifold detail improvements which have been from time to time incorporated by designers in the application of the horizontal principle.

Of the former, the Gas Regulation Act of 1920, by its insistence on thermal values, was perhaps of the most consequence, as the coming of the therm was generally thought to be the herald of town gas distribution of 350 to 400 B.Th.U. value. Such an event would naturally have checked the relative development of horizontals, because the horizontal retort has no *penchant* for the production of gas of this particular quality. The operation of the economics of distribution has, however, decreed that the general demand to-day is for 475 to 500 B.Th.U. gas. Hence a new era has dawned for the horizontal retort.

Of the latter factor, the normal years of coke sales which followed the great war, and the synchronizing of the difficulty in the coalfields, made more manifest the inherent ability of the horizontal retort to deal with any brand of coal that might be forced upon the market in times of labour unrest. Then there are the advantages of high returns in yields of residuals (particularly smokeless fuel, coke), a flexibility which is more generally acceptable to the multitude of growing gas-works, and features brought with modern stoking machinery and heavy charges which have allied much of the advantages of coke ovens to the erstwhile horizontal retort.

Having regard to improvements to detail, fig. 1 shows a rare collection of special interest, as demonstrating the care and attention paid to detail in modernizing this universal principle of carbonization.


LIQUOR TANK HIGHER THAN TAR TOWER.
PATENT 567/25 RE-FLUSH OF MAINS EACH TIME OF TAR WITHDRAWAL
THIS GROUPING OF ASCENSION PIPES, REDUCES GROUND AREA, & VOLUME OF BRICKWORK TO HEAT & MAINTAIN HOT, HENCE ECONOMY OF FUEL.
PATENT 11987/25 ONE ASCENSION PIPE, BUT TWO GAS OFF-TAKES PER RETORT.
TAR RUN-OFF VALVE INTERCONNECTED WITH OVERHEAD LIQUOR REFLUSH VALVE.
NARROW, BUT DEEP REGENERATOR, GIVES MAXIMUM REGENERATION & LARGE GRATE AREA IN A GIVEN ARCH.
WASTE-HEAT DAMPERED FROM EACH ½ TH LENGTH OF RETORT.
PATENT 24743/22, SECONDARY AIR CONTROLLED TO EACH ½ TH LENGTH OF RETORT.
PATENT 24743/22, BOTH SECONDARY AIR, & WASTE HEAT, TUBED FROM INGRESS TO EGRESS, I.E. TUBES BACK-TO-BACK GIVING DOUBLE-WALLS TO PREVENT LEAKAGE.
FLUSHING MAIN.
ACUTELY - INCLINED BRANCHES TO TAR MAIN IN CLEANING TROUGH OF HYDRAULIC MAIN, WHENCE MAIN CAN BE CLEANED OVER ALL THE FLOOR AREA & THROUGH TO TAR TOWER WHILST WORKING WITHOUT LOOSENING A FLANGE.
ALLOWANCE FOR UPWARD GROWTH ON AN EVEN KEEL OF THE ALL-SILICA STAY WALLS.
BUILT-UP X.Y.Z. RETORT, GROOVED & TONGUED, 95% HIGH-HEAT-CONDUCTIVE SILICA.
PATENT 8405/24 SAW-TOOTHED, EDGE TO STAY WALLS, TO ABSORB THE SUPER-THRUST & GROWTH OF SILICA WITHOUT USE OF TIMBER.
PATENT 2510/24 COMPLETE ELLIPTICAL BULL-NOSED ARCHED COMBUSTION CHAMBER, WITH COMBINED KEYSTONE, GIVING MAX.M STABILITY & VISIBILITY OF NOSTRILS.
3-6"
10'-0" CENTRES OF BUCKSTAYS FOR 24"x18" D RETORT.
TOOGOOD & CARR'S PATENT 23731I/25 REGENERATION AT A MAXIMUM WITH THREE ROWS OF TUBES.

Main Arch.—This for a bed of ten large 24 in. by 18 in. retorts is only 8 ft. 6 in. span, with 18-in. pier walls between settings, giving 10 ft. centres of buckstays. Hence, without any constriction of flues, the setting is accommodated on smaller ground area than hitherto. As a result, there is less brickwork to heat up primarily, and less mass to maintain hot; and consequently there is a perpetual saving of fuel, and a reduced capital expenditure.

X Y Z Retorts.—The retorts are built-up of 95 p.ct. high-conductive silica, of X Y Z shape—*i.e.*, there are but three moulds to manufacture the whole retort. The ends of retort are in moulded or built-up firebrick.

Stay Walls.—The inside stay walls are wholly of 95 p.ct.

silica, so that the retorts shall expand upwards on an even keel, to preserve the gas-tight qualities of the retort. Space is left under the crown of the main arch to accommodate for this upward growth of silica.

Absorbing Side Expansion of Silica Stay Walls.—Silica as it is converted by prolonged heating gradually grows an extra 0 to 0·5 p.ct. relative to the expansion of firebrick. To allow of this, and always to support the thrust of the arched crowns of built-up retorts and maintain their gas-tight qualities, is not easy. Timber has been used, but this soon burns away and leaves a space, which is an unknown quantity.

The improvement consists of saw-toothed edges to the stay walls, which, while always contacting with pier walls, to give the necessary abutment to the retort crowns, gradually yield over a long period to the super-thrust of silica growth. Thus each setting absorbs within itself its own expansion and growth, so that it is not cumulative down the bench to originate trouble.

Heat Transmission.—The stay walls as shown are 6 in. thick, and the flues 11 in. between them. As a consequence of this proportion, over 60 p.ct. of the retort walls are exposed to the heating medium, thereby enhancing the ability to burn-off heavy charges of slack coal in regular periods of time. In other words, this virtually gives a large capacity setting on a small ground area.

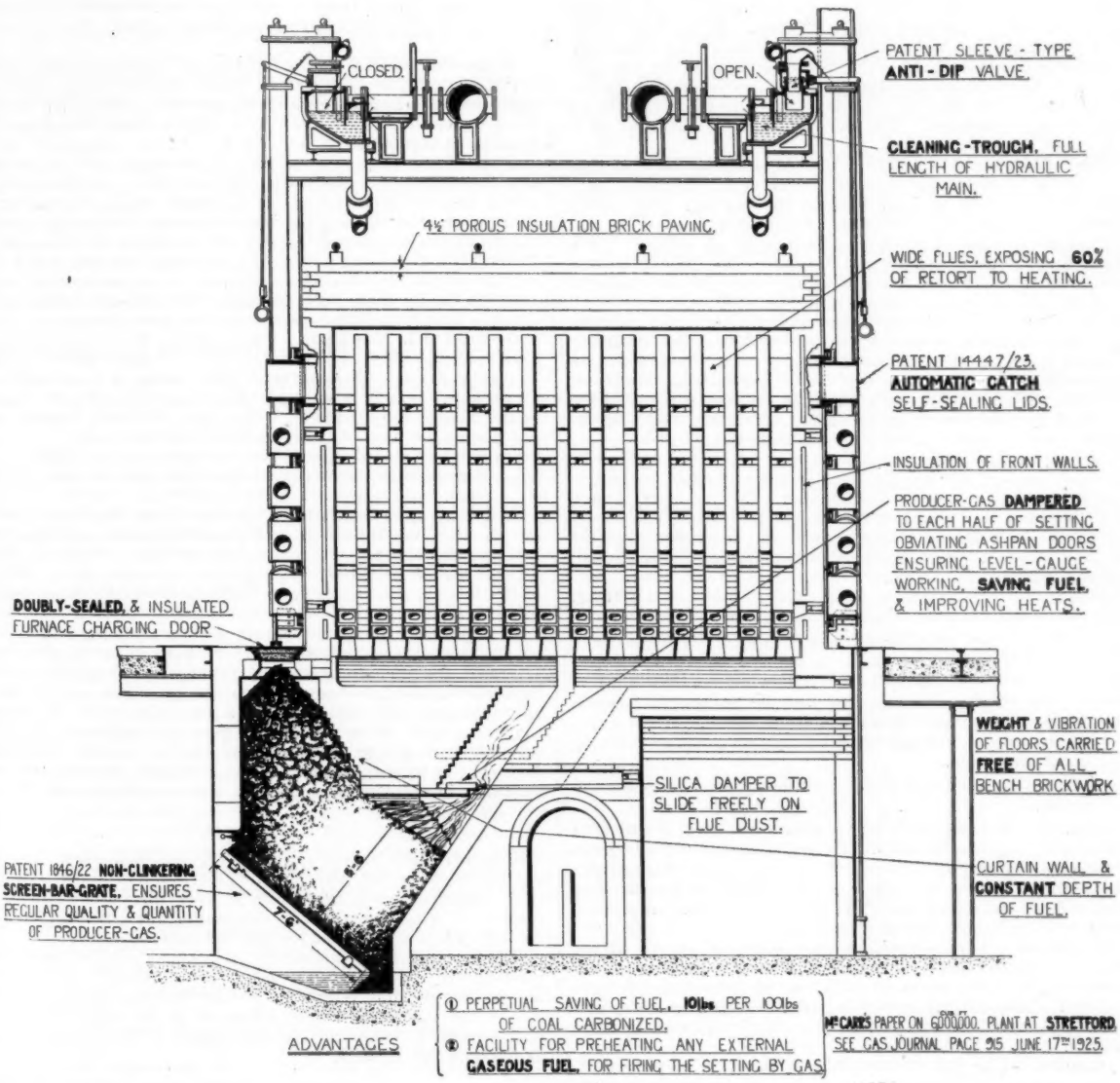
Combustion Chamber Arches.—These arches are complete ellipses of the maximum major and minor axes that the particular grouping of the retorts will allow. The elliptic shape allows the inner cone of the flame issuing from the producer gas nostrils to develop with the minimum of impingement, as illustrated on the drawing.

Bull-Nosed Arch Bricks.—The combustion chamber arches are built from bull-nosed arch bricks, thus reducing impinging and offering no spongy corners (as would a square arch brick) to the dusty flame, so that flue dust cannot enter the pores of the silica to commence a flux.

Producer Arch.—The upper portion of the producer arch is likewise of 95 p.ct. silica, to withstand heating from both the underneath and upper side.

Combined Keystone.—It will be observed that the keystones are common to the producer arch and also to the series of combustion chamber arches. Thus three benefits ensue: (*a*) The keystone of the producer arch cannot lift, as it is held by the combustion chamber arches; (*b*) the legs of the combustion chamber arches cannot be closed by the expansion thrusts of silica, as they are held apart by the keystone of the producer arch; (*c*) the producer gas nostrils and also the secondary air nostrils are brought into visibility from the front of the bench.

Thus this construction renders this vital part of the setting proof against distortion under the strains and stresses localized at this vital part of the structure, and therefore stability of the setting is increased.


CLOSED.
OPEN.
PATENT SLEEVE-TYPE ANTI-DIP VALVE.
CLEANING-TROUGH. FULL LENGTH OF HYDRAULIC MAIN.
4½" POROUS INSULATION BRICK PAVING.
WIDE FLUES, EXPOSING 60% OF RETORT TO HEATING.
PATENT 14447/23. AUTOMATIC CATCH SELF-SEALING LIDS.
INSULATION OF FRONT WALLS.
PRODUCER-GAS DAMPERED TO EACH HALF OF SETTING, OBVIATING ASHPAN DOORS ENSURING LEVEL-GAUGE WORKING, SAVING FUEL, & IMPROVING HEATS.
DOUBLY-SEALED & INSULATED FURNACE CHARGING DOOR
WEIGHT & VIBRATION OF FLOORS CARRIED FREE OF ALL BENCH BRICKWORK
SILICA DAMPER TO SLIDE FREELY ON FLUE DUST.
CURTAIN WALL & CONSTANT DEPTH OF FUEL.
PATENT 1846/22 NON-CLINKERING SCREEN-BAR-GRATE, ENSURES REGULAR QUALITY & QUANTITY OF PRODUCER-GAS.
ADVANTAGES
① PERPETUAL SAVING OF FUEL, 10lbs PER 100lbs OF COAL CARBONIZED.
② FACILITY FOR PREHEATING ANY EXTERNAL GASEOUS FUEL, FOR FIRING THE SETTING BY GAS.
McCAW'S PAPER ON 6000,000 PLANT AT STRETFORD SEE GAS JOURNAL PAGE 915 JUNE 17TH 1925.

PRODUCER.

The producer of any setting is the driving force; and therefore too much attention cannot be given to its design. Accordingly the following improvements will be of more than passing interest.

Furnace Charging Door.—This is doubly sealed—that is to say, it has a metal-to-metal seal—and dust can be swept from the floor on to the chamfered back of the charging door to form an additional dust seal, which dust falls harmlessly away on opening the door, as the metal faces are at 45°. This door is insulated on the inside by porous bricks.

Curtain Wall.—In vertical retort carbonization the constancy of the depth of fuel has proved to be of great value. Therefore this constancy has been applied to the improved horizontal retort setting, the design of this curtain being such that no leakage of air from the charging door can enter the producer gas chamber without passing through incandescent coke; and the volume of this sealed coke chamber between the furnace charging door and the curtain wall is such that a complete discharge from one retort can be contained therein.

Screen-Bar Grate.—There are nearly 200 of these grates working successfully. To those who have no experience, it would come as a revelation how differently coke burns on the steeply-inclined smooth and uninterrupted screen-gate as compared with the step-grate. With a step-grate each step tends to accumulate the coke and hold it stationary, which accumulation is quickly cemented by the ash, thus not only disturbing the good working of the fire, but needing the attention of the furnace-man to release same. With the screen-bar grate there is no such accumulation. The coke creeps continuously down the grate, and the ash gravitates into the ashpan; and, there being no clinkering period, the producer gas both qualitatively and quantitatively feeds more uniformly into the setting, to maintain the heats in a more ideal and economic manner.

Ashpan Doors.—It will be observed that there are no ashpan doors, and that the ashpan is of brickwork. These features are those which have proved so satisfactory with vertical retorting.

Producer-Gas Dampers.—The fire is controlled by two producer-gas dampers, so that the producer gas is actually limited to each half of the setting, whereby fuel is saved and heats are more closely controlled. The dampers are of silica, so as to slide easily over the flue dust.

Dumb Chamber.—It will be observed that for the first time use is made of the dumb chamber, in order to control the producer gas dampers to each half of the setting, from which chamber the dampers can be better reached and inspected.

Furnace Linings.—The furnace linings are of specially hard-burned high alumina bricks, and are backed by the regenerator tubes, which will make a much tighter construction than the usual method of simple brickwork and brick flues.

Regenerators.—These are cellular in construction, built completely with machine-made smooth fireclay tubes; the secondary air being tubed all the way from the ingress to the combustion chamber, and the waste heat all the way from the ingress to the main flue. Thus an extremely air-tight, but thin 2-ply, division is formed between the waste heat and secondary air, whereby the efficiency of regeneration is at the highest.

The full depth of the heated brickwork (13 ft.) is utilized by regenerator tubes, whence the greater perpendicular column of rarified air passes into the combustion chamber even though the setting may be working under a slight pressure. The waste-heat tubes are sufficiently large, and point horizontally to the outer wall, so that they can be readily inspected, cleared of dust, and repaired from the inside.

For low fuel consumption, within the confines of a setting, regenerators cannot be too large. This 3-row regenerator can be adopted without increasing the width of arch, and gives a three-fold advantage:

(1) A very low fuel consumption.

(2) A means for preheating any outside source of gaseous fuel—*i.e.*, producer gas made from breeze, or coal gas—at any future period without altering the setting or letting down the heats.

(3) The ability to change at will to either gaseous or solid fuel firing.

Secondary Air Control.—The secondary air for the setting is controlled by eight inlet slides. Thus a definite control is given for *each quarter length* of the retort on *each* side of the setting; and, it being possible to control the secondary air to such fine limits, not only are good heats ensured, but fuel consumption is maintained at the greatest efficiency.

Waste-Heat Control.—Similarly, by dampers shown in the tubes, the waste heat is exhausted or controlled from each quarter-length of the retort on each side of the setting by eight waste-heat dampers just inside the outer walls, where they can be readily seen and inspected and operated with greater certainty.

Insulation.—The top of the bench is paved with porous insulation bricks, and the front walls provided with a layer of insulation brick built into the cavities formed within the walls.

BENCH MOUNTINGS AND GAS OFF-TAKE.

Cast-Iron Sheaths.—The ends of the retorts are fitted with cast-iron sheaths, thereby making a sound gas-tight joint between ironwork and retort, and also taking-up the expansion in the length of the retort on being heated.

Two Outlets per Retort.—An improvement and simplification has been originated, inasmuch as each retort has two outlets or gas off-takes, while there are only ten ascension pipes per bed of ten retorts. This is accomplished by inclined connecting branches between the mouthpieces, as shown. The retorts will be stoked as usual in horizontal tiers. The pipes can be augured and the retorts charged in precisely the same manner as though there were two ascension pipes per retort. In years gone by, through retorts have been built with one ascension pipe on one side only. This was good practice a few years ago; but with the increased use of heavy charges, it is found that the charge sometimes, and quite inadvertently, swells-up towards the centre of the retort, which blocks-off to a surprising degree the egress for the gas. It is therefore considered that to-day two outlets per retort are essential to best practice, especially where the projecting type of stoking machinery and heavy charges are in vogue.

Ascension Pipes.—It will be observed that there are ten ascension pipes per setting—*i.e.*, one to each retort—grouped five on each side of the bed. Hence there are fewer pipes to augur, and therefore there is less retort house work.

Anti-Dips.—Anti-dip valves are generally preferred, as by their use the interior of the retort can be maintained much nearer to level-gauge throughout the carbonizing period. For example, with a seal the pressure in the retort must be sufficient to overcome the inertia of that seal; and when the volume of rich gas is at the maximum there will be a pressure in the retort, leading to degradation of gas and reduction of yield. On the other hand, if the seal can be adjusted extremely light to overcome the above objection, then towards the end of the charge, the lean gases being small in volume, there may be a slight vacuum in the retort which again would lead to deterioration. Many types of anti-dips have been tried-out; and it is believed that the sleeve type shown on the drawing is the best.

Hydraulic Mains.—As the outcome of experience with vertical retorting over the last sixteen years, the hydraulic mains are fitted with continuous open lutes, and with a flat floor immediately under the lute, so that, by a simple shovel, the mains can be cleared very easily.

Tar Main.—The tar main is arranged at an inclination immediately underneath the open lute of the hydraulic main, and the branches of the hydraulic main arranged at an inclination—thus giving the very important advantage that the tar main can be cleared throughout its length and into the tar tower without spilling a drop of liquor or slackening a bolt. In works where this has been adopted it is the custom to go through the tar main with an augur once a month, when everything is kept remarkably clean and free from deposits.

Re-flush Tar Take-Off.—Surmounting the tar tower is a liquor tank, which is connected by a liquor main to each hydraulic main. This overhead liquor main is controlled by a valve, which is inter-connected with the tar run-off cock situated at the base of the tar tower. Thus the attendant, from the one position at the base of the tar tower, simultaneously:

(1) Re-flushes with liquor the hydraulic and tar mains.

(2) Runs-off the tar accumulation with perfect safety to his seal.

It will be observed that the overflow from the liquor tank is fed as a visible dribble to each hydraulic main, and also furnishes a dribble into the seal pot at the base of the tar tower, whence visible evidence is brought to the one working position at the base of the tar tower to enhance every-day thoroughness of working.

Foul Mains.—Two foul mains are recommended along the bench, as shown on the drawing. This arrangement gives considerable facilities for cleaning through the branches to the hydraulics; and, moreover, when the governor is situated in approximately the central position over the series of settings that it controls, these twin mains give very large area for flow, whereby level gauge is much more nearly attained in practice over all the beds controlled by the governor, with obvious advantages in securing the last two gaseous therms which spell efficiency.

CONCLUSION.

A constructive survey of the foregoing will show that designers of gas-works plant of this description are fully versed in their responsibilities, in aiming at ever higher efficiencies, in respect of what even to-day constitutes the chief carbonizing agency in use throughout the gas industry.

When technical advancement is coupled with a gain commercially in reduced prime cost of installation, as is set forth above, then we may venture to predict that such inspiration will ensure for horizontals wide adoption in the difficult task of maintaining a cheap and constant supply of gas from all sorts and conditions of coals.

Flow Meters.—In a lecturette delivered before the Junior Institution of Engineers on the subject of "Flow Meters," Mr. W. H. Simmons, A.I.C., described the "Rotameter," which has come into prominence recently. The instrument consists of a vertical transparent tube tapering towards the lower end, and containing a float which is kept suspended by the upward flow of liquid or gas which is being measured. The height of the float in the tube indicates directly on a scale marked on the tube the rate of flow. There are several grooves on the outside of the float, so that the stream of liquid or gas keeps it in rapid rotation. Mr. Simmons said that the "Rotameter" was accurate to within 2 p.ct., due to the fact that it was entirely frictionless. There was no wear or deterioration over long periods. "Rotameters" were used, among other industrial processes, for many purposes in gas-works.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION—AUXILIARY SECTION.

[At this meeting there were two important papers. In that by Dr. Smith and Mr. Finlayson the authors put forward, in practical form, suggestions whereby the gas industry may benefit from more scientific treatment of the crude gas. The published opinions of the Chief Alkali Inspector are recalled; and means are outlined for the solution of the waste-liquor problems enumerated by him. Remarks on benzole policy, liquid purification with recent developments, sulphate production without sulphuric acid, and synthetic alcohol, provide a wealth of subject-matter for deliberation. The other paper deals with sulphate of ammonia. There are two equally important features in the manufacture of this fertilizer. One is to produce a salt of the necessary purity; the other is to see that its mechanical condition is such as to preclude as far as possible subsequent caking either in store or in transport. On both these points—and particularly on the latter—Mr. Cummings has much valuable information to impart; and his admirably concise paper is of great interest.]

The Thirteenth Half-Yearly Meeting of the North of England Gas Managers' Association (Auxiliary Section) was held on Saturday afternoon, at the offices of the Newcastle and Gateshead Gas Company, Grainger Street, Newcastle—Dr. GEOFFREY WEYMAN presiding.

The CHAIRMAN moved that Mr. Charles G. Barrett, of West Hartlepool, be elected Chairman of the Auxiliary Section for the ensuing year. He thought Mr. Barrett would prove a very enthusiastic and able Chairman.

The proposal was unanimously agreed to.

There were two vacancies on the Committee, and to these Mr. C. F. Barrow (Sunderland) and Mr. L. M. Weldon (West Hartlepool) were elected.

Mr. A. H. BAGSHAW, of Sunderland, was re-appointed Hon. Secretary, and heartily thanked for his past services.

DEVELOPMENTS IN THE TREATMENT OF CRUDE GAS.

By E. W. SMITH, D.Sc., F.I.C., M.I.Chem.E., and
T. CAMPBELL FINLAYSON, M.Sc., A.M.I.Chem.E.

INTRODUCTION.

In these days of frequent meetings of the Associations connected with the gas industry, it is becoming increasingly difficult for authors to present papers of noveity and interest. A consideration of the titles of the papers read before the various Associations would seem to show that the subject of the general methods of the treatment of crude gas before it reaches the service mains has not received the attention it merits. The object of the present contribution is therefore to give a brief description of some of the recent developments in this branch of gas engineering.

GAS CONDENSATION.

An examination of the methods employed for the condensation of gas, and for the removal of ammonia, tar, &c., in many gas-works, would seem to show that scientific principles have not been employed to the same extent in the development of this section of gas manufacture as in the design of plant (say) for the carbonization of coal. It is not unfair to state that, in many cases, condensation and bye-product recovery are regarded as evil necessities which have to be met before the crude gas can be delivered to service mains. Extension to carbonizing plant is often followed by a further overloading of an already unscientific condensation and washing system; this overloading being met by the addition of another scrubber at the end of the existing series.

Confirmation of these statements can be found by perusing the reports of visits to the various gas companies in this country made by the Gas Associations, and then tabulating the order and size of condensing and scrubbing plant for varying capacity of plant.

In brief the usual gas-works method of condensation is for the crude gas to be subjected to cooling in atmospheric or water-cooled condensers in which a large portion of the water and tar, together with about half the ammonia, is condensed. The cooled gas then passes to a washer of the Livesey type to remove tar, and then to either horizontal scrubber washers or vertical centrifugal washers. It appears to be the normal practice to have two, three, or four washers in series to remove the ammonia to the required extent—say, 4 grains per 100 c.ft. The final washer is fed with fresh cold water or weak ammonia liquor, and the weak ammoniacal liquor therefrom is fed to the other two scrubbers in a counter-current direction. The ammoniacal liquor is then mixed with the liquor from the condensers, which has previously been separated from the tar.

During the past year or two, the whole problem of condensation has been receiving more attention. The reasons for this are briefly as follows:

(1) Changes in the methods of carbonization have resulted in alterations in both the chemical composition and strength of the ammoniacal liquor produced.

(2) Increased vigilance on the part of River Boards, as regards pollution of streams, has led to a closer scrutiny of ammonia plant effluents.

(3) The production of synthetic ammonium sulphate in large quantities has led to a reconsideration of the economics of sulphate manufacture from gas liquor, and means for reducing the cost of production—steam, acid, &c.—have received much attention.

The literature upon the subject of gas condensation in relation to ammonia plant effluents has recently been greatly enriched by the paper presented by Dr. Bailey, the Chief Alkali Inspector, at the annual meeting of the Institution of Chemical Engineers in July, 1925. The thanks of the gas industry are due to the work which Dr. Bailey and his associates have been doing during the past few years on this subject, and particularly for the presentation of his data in a form which is of practical guidance to the industry. In passing, it may be mentioned that Dr. Bailey's paper is to be the subject of a special discussion of the Institution of Chemical Engineers early next year. Expressed briefly, the theme which he expounds is as follows:

The objectionable constituents in ammonia plant effluents are the oxygen-absorbing bodies. These are mainly either tar acids (usually phenols) or the oxidation products of ammonium sulphide and cyanide—namely, ammonium thiosulphate and thiocyanate. The phenols found in the ammoniacal liquor are chiefly due to the intimate contact which is allowed between the ammoniacal liquor and the tars during and after condensation—these phenols are particularly found in liquors from vertical retort installations.

The ammonia oxidation products are due to one or both of two causes—either the excessive circulation of the liquor in an atmosphere containing oxygen, or the storage of the liquor for too long a period before subjecting it to treatment in the ammonium sulphate plants.

Dr. Bailey suggests that the difficulties associated with waste liquor disposal would be materially decreased by the application of the following principles:

(1) To reduce the volume of effluent.
(2) To have minimum contact between tar and ammoniacal liquor.
(3) To keep thiocyanate and thiosulphate out of the ammoniacal liquor by preventing oxidation of the liquor.
(4) To evaporate the devil liquor by waste flue gases, instead of mixing it with the still effluents.

We propose to examine these principles from the point of view of practical application on existing works.

1. *Volume of Effluent.*

In the process of distillation of an average gas coal, there is condensed in the atmospheric or water-cooled condensers 20 to 30 gallons of liquor, varying from 5 to 8 oz. strength (1 to 1·7 p.ct. NH_3). The strength and quantity of the liquor from the condensers depend upon a variety of factors, such as:

(*a*) Amount of ammonia made from the coal.
(*b*) Percentage free moisture in coal.
(*c*) Percentage oxygen in coal.
(*d*) Presence or absence of "steaming" conditions in the case of vertical retorts, and efficiency of cracking of the steam.

In addition to the liquor from the condensers, it is necessary to add water to the mechanical scrubbers, in order to remove all the ammonia from the gas, with the exception of the few grains left in the gas for purposes of oxide purification. The result is that the gas-works liquor to be distilled is usually 8 to 10 oz. strength.

One of the present authors has for some years been advocating a means of reducing the quantity and increasing the strength of ammoniacal liquor, by the installation of an acid catch to remove the last 40 grains or so of ammonia. In this suggested process, the gas, after passing through condensers, would enter one horizontal or vertical type mechanical scrubber, and thence to an acid catch. The ammoniacal liquor from the condenser would be separated from tar, and in a cooled condition be used as the scrubbing liquid in the mechanical washer. The acid to be used for the manufacture of sulphate of ammonia would be first allowed to pass through the acid catch, and then, containing a certain amount of ammonium sulphate in solution, be used up in the saturator in the normal way. A by-pass would be arranged on the gas supply to the acid catch, and thus would allow sufficient ammonia to pass forward to the purifiers, to prevent souring of the oxide.

The following advantages would result as the adoption of this process:

1. Amount of liquor to be disposed of would be reduced to a minimum. Under normal conditions, the liquor condensed should be sufficient to act as feed for the mechanical scrubbers; and seeing that no attempt is made to remove all the ammonia by water washing, a liquor strength of 16 to 18 oz. (3·5 to 4 p.ct. NH_3) should easily be attained.

II. The amount of thiocyanate and other objectionable constituents in the liquor would be less, due to the elimination of the intimate contact between gas and washing liquor, which is necessary in the final mechanical washers. The thiocyanate content of the effluent liquor has an important bearing upon the ease of its disposal.

III. Amount of steam required per ton of sulphate of ammonia to distil liquor is reduced considerably. From the data given by Parrish, in his book "Design and Working of Ammonia Stills," we can make the following calculations for the treatment of 8 and 16 oz. liquor:

Process Used.	Condensers and 3 Mechanical Scrubbers.	Condensers, 1 Mechanical Scrubber, 1 Acid Catch.
Strength of liquor	8 oz.	16 oz.
P.ct ammonia in liquor	1·73	3·48
Gallons liquor to be distilled per ton sulphate of ammonia	3260	1630
Lbs. steam required per ton sulphate of ammonia	3600	1750
Gallons liquor to be disposed of per ton sulphate made	4890	2445

From this simple calculation, it will be seen that the volume of effluent to be disposed of is reduced by half, and also the amount of steam required per ton of sulphate of ammonia is reduced by more than half. It will therefore be appreciated that the adoption of a process using the acid catch would be a factor towards removing the difficulties associated with effluent liquor disposal.

The general adoption of the sale of gas upon a calorific instead of an illuminating power basis has removed the possible objection that the illuminating power of the gas is reduced by direct contact with sulphuric acid.

2. *Minimum Contact between Tar and Ammoniacal Liquor.*

In the usual process for the condensation of ammonia and tar, maximum opportunity is given for the intermixing of the tar and the liquor in the hydraulic mains, the mechanical scrubbers, and the separation and storage wells. Anything which reduces the time contact will improve the quality of both the liquor and the tar. There would appear no adequate reason why the major portion of the tar should not be separated from the liquor at earlier stages than in present practice. In this connection, there appear three alternatives:

(*a*) To leave the offtake pipes and hydraulic mains as at present, but to arrange for a cyclone or other efficient tar extractor at some point along the foul main, as near as possible to the gas offtake. In this tar extractor, the major portion of the tar would come down, and would leave only a small portion to be removed by the mechanical washers.

(*b*) To lag the offtake pipes, and keep the gas at a temperature above 100° C. until it reaches a cyclone tar separator, and remove nearly all the tar without allowing any of the liquor to be condensed.

(*c*) To spray the offtake pipes with hot liquor at a pressure of 80 lbs. per sq. in. The spray should be rich in ammonium salts and low in free ammonia, and should be sprayed at a temperature above the dew-point of the crude coal gas. By this means the tar will be brought down before the ammoniacal liquor.

In general, the aim should be to bring the tar down before the ammoniacal liquor. The effect of this will be to give an ammoniacal liquor more free from undesirable constituents, and also a tar more easily dehydrated.

3. *Thiocyanate and Thiosulphate.*

Thiocyanate and thiosulphate are formed in the ammoniacal liquor, mainly by interaction of the liquor with air. It is found that contact between the liquor and air leads to an increase in the formation of these undesirable products, and also that increase in temperature aids their formation. Therefore every effort should be made to keep the mains and condensers as free as possible from air leaks, and also to reduce the temperature of the liquor as quickly as possible. In addition to this, the ammoniacal liquor should be stored for as little time as possible before being subjected to distillation.

As practical suggestions for the working of a more scientific method of condensation, we would lay before you three suggested schemes:

Scheme I.—Gas from retorts passes through normal offtake pipes into hydraulic main. At the end of each bench of retorts is placed a cyclone extractor, to remove tar. The gas then passes to water-cooled condensers. From there, the gas passes to one mechanical washer fed with liquor from water-cooled condenser. The mechanical washer is worked to make 16-oz. liquor. The gas from the mechanical washer passes to an acid catch, to remove the remainder of the ammonia, and the acid from the catch, together with the 16-oz. ammoniacal liquor, passes forward to the ammonium sulphate plant.

Scheme II.—The gas leaving the retorts is sprayed at a temperature above the dew-point of the crude gas, with liquor rich in ammonium salts but low in free ammonia; the sprays being worked at high pressure. The majority of the tar is brought down before any ammoniacal liquor is condensed. The gas passes forward to water-cooled condensers, wherein the ammoniacal liquor is condensed, and thence the treatment is as in Scheme I. The tar is separated from the circulating liquor, which after cooling is re-circulated.

Scheme III.—The offtake pipes, seal pots, and hydraulic mains are lagged for a convenient distance, at which point tar is brought down by a tar extractor of the cyclone type, after which the gas passes to water-cooled condensers, wherein the liquor and the remainder of the tar is brought down. The gas then passes forward to the mechanical washer, and the process is as in Schemes I. and II.

It is considered that the adoption of one of the above three schemes would materially help in works faced with the difficulties of waste still liquor disposal.

As far as is possible, the liquor used for spraying the offtake pipes should not be mixed with the liquor to be distilled, but should be separated, cooled, and re-circulated. This is not always possible, particularly in coals which tend to give pitchy offtakes, and which contain high percentages of ammonium chloride.

4. *Evaporation of Devil Liquor.*

There appears every reason to support the suggestion that the "devil liquor" (the condensate produced by the cooling of the vapour after the ammonia has been removed) should be evaporated by waste flue gases in suitable shallow cast-iron pans. From Dr. Bailey's figures, it would seem that the evaporation of this liquor will, in many cases, reduce any effluent liquor troubles to more manageable proportions, as the devil liquor contains about 40 p.ct. of the total phenol of the original ammoniacal liquor.

Benzole Recovery.

The decision as to whether it is advisable to remove benzole from the gas is purely an economic one. If a gas engineer can obtain more money for a therm in the form of gas than in the form of liquid benzole, he will naturally not undertake the recovery of the latter. From figures which are available, it would appear that, on the present price of benzole, taking into consideration process losses and cost of operation, a gas company obtains a bigger return per therm of benzole by selling it as gas than by recovering it as liquid. It must be remembered that benzole cannot be assessed entirely on its therm value, as, owing to its high calorific value, it is possible to dilute the gas containing benzole with a certain quantity of relatively low calorific value gas, while yet maintaining the required average calorific value. On works in which oil washing is necessary, in order to remove naphthalene, the additional cost of benzole recovery is considerably reduced; but even in this case the factor of enrichment mentioned above comes into play. In general, at the moment, the process of benzole recovery on a gas-works does not appear an attractive proposition.

Liquid Purification of Gas.

Considerable progress has been made during the past year towards the solution of the problem of an economic process for the complete removal of sulphuretted hydrogen and other impurities from gas by means of a liquid process. It will be remembered that in 1921 the Koppers Company of America developed a scheme of liquid purification depending upon the use of a solution of sodium carbonate. The impurities were removed from the coal gas by contact with this solution in an absorption tower, and then the fouled solution was regenerated by blowing air through the solution in another tower. This scheme was not applicable to English practice, owing to the restrictions of the authorities as regards the discharge of sulphuretted hydrogen into the atmosphere; and though the process met with a considerable amount of success in America, no plant was constructed in this country.

The Koppers Company of America considered that, though on ground space, capital cost, and operation expenditure, the process was much in advance of the normal method of dry oxide boxes, yet it was not ideal; and they set out to develop a scheme which would include two additional advantages—first, that the sulphur should be recovered as a bye-product, and, secondly, that no noxious fumes should be sent into the atmosphere.

By the courtesy of Mr. F. W. Sperr, Director of Research of the Koppers Company of America, we are able to place before you information on the recent work which has been done upon this subject, and which has led to the development of a process holding all the main requirements of success. This new liquid purification process has been in continuous operation for over a year on a demonstration plant operated by the Koppers Company at the works of the Seaboard By-Product Coke Company, Jersey City, New Jersey. The plant has in every way fulfilled expectations, and is treating about ¾ million c.ft. of coke oven gas per 24 hours. Of the sulphuretted hydrogen 100 p.ct. has been removed from the gas by this plant on test runs of long duration. Large installations of the process are being made at Baltimore, St. Louis, Detroit, Grand Rapids, Rochester, and three other works. The process may briefly be described as follows.

The gas to be purified is brought into contact with a washing liquid consisting of a non-corrosive alkaline solution which absorbs the hydrogen sulphide and hydrocyanic acid. The washing is carried out in a special type of absorption tower. The fouled liquor is then aerated in a special apparatus in such a way that the spent solution is oxidized, at the same time liberating sulphur, which rises to the surface. This sulphur is separated from the liquor by filtering or centrifuging. The washing liquid, after regeneration in the aerating apparatus, passes back to the absorption tower. Practically all the hydrocyanic acid is converted into thiocyanates, which, on account of their very high solubility, accumulate in the system until a point is reached where their rate of formation is balanced by the ordinary mechanical losses.

Examination of the process, in comparison with oxide purification, shows that the adoption of such a scheme has advantages in several directions. The most serious disadvantage of oxide boxes is the large amount of ground space occupied. Even if three-tier type boxes be adopted, the ground space is considerable, and the capital cost of such construction excessive. In addition to this, the area of oxide boxes is strictly proportionate to the amount of gas to be purified. With liquid purification, the ground space saving is considerable, probably of the order of 50 p.ct., and, within limits, the larger the plant the greater the saving. The capital cost is stated to be appreciably lower than that of oxide boxes. In the liquid purification process all the cyanogen is removed from the gas, and by this means the meter corrosion troubles are reduced to a negligible quantity. When it is considered that in many cases meter corrosion charges amount to as much or more than the purification charges, the importance of this saving will be appreciated.

When working oxide boxes, it is essential that there shall be added to the gas sufficient air to keep the oxide boxes working satisfactorily; and it is also necessary to by-pass a certain amount of ammonia. With the new liquid purification process, neither of these things is necessary. The elimination of the revivifying air leads to an increase in the calorific value and a reduction in the specific gravity of the gas. The fact that no ammonia is required in the gas entering the liquid purification plant makes it more simple to instal direct ammonia recovery, or, alternatively, an acid catch to remove the last 40 grains of ammonia from the crude gas. The sulphur is obtained in a comparatively pure form, with the result that the value is increased over that obtained for oxide; and, lastly, as far as information goes, it would appear that the over-all operating costs compare favourably with oxide boxes when dealing with large plants.

The technical staff of the Koppers Company of America deserve congratulation for their development of this process.

Sulphate Production Without Sulphuric Acid.

It is interesting to note progress in the development of an ingenious process for the production of sulphate of ammonia without the use of sulphuric acid, which has been worked out by Dr. Arthur Jaques, Mr. J. H. West, and Mr. J. S. Morgan, and is covered by British Patent No. 215,470. We understand that one plant is in operation in the North of England.

In this process, ammonia vapour, and water vapour or liquid water in a very fine state of division are brought into a reaction chamber where they come into contact with a gaseous mixture comprising sulphur dioxide and air; the reaction temperature being maintained just below 100° C. The concentration of sulphur dioxide is about 4 p.ct. of the total volume of gases. The control of correct temperature is important, as excessive temperature brings about the formation of undesirable products. In operation, the control of temperature is very simple.

As the result of interaction between the sulphur dioxide and the ammonia vapours, a cloud of ammonium sulphite is formed, which collects in hoppers placed at the base of the reaction chamber. This ammonium sulphite is in a highly reactive physical condition, and in contact with air rapidly oxidizes to ammonium sulphate, with considerable rise in temperature. All that is necessary for the conversion of the ammonium sulphite into sulphate is to place the sulphite in heaps sufficiently large to avoid the over-rapid dissipation of the heat produced by the oxidation; the heaps being gently raked-over at suitable intervals, to expose all parts of them to the air.

When the product is made from pure ammonia gas, a pure white ammonium sulphate is produced. When, however, the impure ammonia gases from the distillation of gas liquors are used, a cruder form of ammonium sulphate is produced containing ammonium thiosulphate, &c. The ammonia content of this material is about 23 p.ct. NH_3. The use of impure ammonia gas also has an effect on the rate of oxidation of the resulting product. In connection with gas-works practice, the alternatives are either to purify the ammonia gas from the still before introducing the gas into the reaction vessel, or alternatively, to find a suitable market for the crude sulphate of ammonia. The attractiveness of the process, apart from the saving on sulphuric acid, would seem to be its possible application to small works making insufficient ammonia to justify the installation of a sulphate plant. The further development of the process, and the results of field tests on the impure sulphate of ammonia made from the ammonia still gases and sulphur dioxide, will be watched with interest by the gas industry.

Synthetic Alcohol from Gas.

During the past two years a process has been developed by the Cie. des Mines de Bethune, France, for the production of synthetic alcohol from coke oven gas. The scheme has been described by the Superintendent, M. Vallette, in "Chimie et Industrie" (May, 1925). The claim is made that the process is applicable to any gas-works. The Mines de Bethune Company have in successful operation a synthetic ammonia plant on the Claude system, for which the necessary hydrogen is obtained from the coke oven gas. The process for the recovery of alcohol forms an addition to this process. The hydrogen for the ammonia plant is separated from the other constituents of the gas by a liquefaction method which also allows of the recovery of the ethylene. The ethylene is obtained at a concentration sufficient to ensure its ready absorption by sulphuric acid—namely, 20 to 30 p.ct.

To obtain rapid absorption of the ethylene by the sulphuric acid, the gas rich in ethylene is bubbled into a mixture of sulphuric acid and sulphovinic acid at a temperature of 40° to 50° C. The ethylene content of the acid is maintained as nearly as possible at 18 p.ct. To obtain the alcohol, the sulphovinic acid is hydrolized in a type of continuous still in which the steam and ammonia circulate in counter-current to the sulphovinic acid. The steam and ammonia are both heating and hydrolizing agents. The heat resulting from hydration of the sulphuric acid, and also from the formation of ammonium sulphate, is used for the distillation of the alcohol produced. The ammonia ensures that the hydrolysis reaction will proceed in the right direction, as it removes the liberated sulphuric acid from the sphere of reaction by forming ammonium sulphate—thus the rapid hydrolysis.

At the Mines de Bethune, the dilute sulphuric acid from the alcohol plant will all be used up in the sulphate of ammonia plant, which receives a supply of ammonia from the synthetic plant as well as from the ammonia stills; but on a gas-works without a synthetic ammonia plant, there would be a surplus of dilute sulphuric acid from the alcohol plant over and above that required for converting a normal amount of ammonia from the coal into sulphate of ammonia. It would appear that very careful consideration would have to be given to the economic disposal of this excess dilute acid before the alcohol process can be adopted on a works without a synthetic ammonia plant.

From the above remarks it will be seen that closer attention to the subject of the scientific treatment of crude gas would pay the gas industry. It may be confidently asserted that such progress will have not only a marked effect upon the economics of gas manufacture, but will also offer a solution to many difficulties associated with the operation of gas-works.

Dr. Smith read the paper, and prefaced it by saying that coke had received little or no attention from gas undertakings. The young men in the gas industry believed that the industry was going to be something very much greater than ever it had been. If the price of gas could be reduced, there was no boundary to its use; and in this connection there needed to be a greater study of coke. He asked them to encourage the study and betterment of coke in every possible way. Coke would "go;" and the better backing it got, the more it would "go." He suggested that they should closely study the blending of coals in the making of coke. It was possible to make coke from non-coking coals, with proper blending and treatment. By being able to use any class of coal, it should be possible to produce gas at a lower price, and so bring in economies never heard of before. There must be closer co-operation between the coke industry and the gas industry. Prejudice must be broken-down, and more room afforded for full co-operation between the two industries. This would help each of them. There was a big future for the coke industry, as for the gas industry.

MECHANICAL CONDITION OF SULPHATE OF AMMONIA.

By A. D. Cummings, B.Sc.

Considerable improvement in the quality of sulphate has been effected in recent years by the introduction of neutralizing and drying processes. At the present time 80 p.ct. of the sulphate produced in Britain is neutralized, while a few years ago the figure was only 6 p.ct. Attention has been focussed on the problem of obtaining the greatest possible purity; and many works now turn out a product 99·7 p.ct. pure—a very creditable figure when we consider that sulphate is directly produced in one operation. While the mechanical condition has not been entirely overlooked in this endeavour to obtain a pure salt, it was considered of secondary importance until attention was directed to it by our foreign buyers. The Sulphate of Ammonia Federation have recently suggested that the poor condition of British sulphate is responsible for the drop in exports to Japan from 85,000 tons in 1923-24 to 36,000 tons in 1924-25; and, as they take a serious view of the situation, they have appointed a Technical Committee to inquire into the causes of caking trouble, which is the chief point at issue.

From this it appears that the question of mechanical condition is of immediate importance to all sulphate manufacturers.

It must be borne in mind that, above a certain minimum, the ammonia content of sulphate is not so important to its user as is the condition in which he receives it. He desires to spread it on the land efficiently in the proportion of 100 to 200 lbs. per acre as easily as possible; and it is small comfort to him to know that the ammonia present approaches the theoretical content if the bags each contain a solid 2 cwt. block which must be reduced to powder before it can be used.

THE PRESENT CONDITION.

The Federation have from time to time urged its members to strive after a uniform product; so that, as far as possible, sulphate produced in different parts of the country shall present a uniform appearance, whether produced in Newcastle or Birmingham, whether in a gas-works or bye-product works. At the present time it cannot be said that this has been achieved. A shipment of sulphate, made up in small parcels from several works, varies from parcel to parcel in several features. The crystal grain is different in each; and while this is largely unavoidable, it is, on the whole, too small. The colour is variable. It is hard to convince the buyer, who is not an exact scientist, that brown powdery salt and white crystalline salt, both bearing the Federation label, are equally good for his purpose. It may seem unnecessary to spend time and money in obtaining a salt pleasing to the eye. It probably is so; but the human factor must be considered in dealing with a buyer who uses no other means of judging. The moisture content of the various parcels ranges from 0·1 to 2 p.ct.; and this variation leads to conditions in the ship's hold during the voyage which are detrimental to the drier salt. Probably at this date the bagging will be uniform, though this was at one time a source of complaint, as was also the difference in the size of the bags. Some time ago it was pointed out that bags appeared to contain less when the salt was in finely divided condition. Each of these sources of lack of uniformity will now be considered.

GRAIN.

In dealing with grain, crystal size only is referred to. Many difficulties in dealing with sulphate would be lessened if the average size of the crystals was bigger. Neutralizing and drying would be more easily carried out, and the caking tendency reduced. There is an upward limit of grain size, of course, though this has never been defined, but few makes now contain crystals over $\frac{1}{10}$ in. in length.

Sulphate of ammonia suffers from the fact that it is produced in an apparatus which combines several operations in one. The saturator which has remained essentially the same in design since the beginning of sulphate manufacture, although much improved in details, acts as an absorber, evaporator, and crystallizer. For each particular saturator, there is an upward limit of crystal size which is fixed by the time during which the crystals grow; this being determined by the concentration of ammonia in the gases and the efficiency of the distribution. If the design is bad, little can be done to improve the grain of salt it turns out. The small square saturators, in use in plants making up to 3 tons per day, which have an open fishing pocket, turn out a salt differing from the circular, totally enclosed saturators in use on larger plants.

In the first case, the crystals (as soon as they are formed) fall to the sloping floor of the saturator, and slide forward into the fishing pocket. The crystals grow but little, being in contact with others almost from their formation; and the temperature of the bath is usually lower than in the larger plants. The result is a salt which is small, but which is remarkably uniform (*e.g.*, F in table) which makes it easy to manipulate in drying and neutralizing, despite the small grain. The crystals themselves are almost square. In the larger saturators there is a greater distance between the cracker pipe and the well from which the salt is ejected. This allows the crystal a longer passage through the bath of mother liquor, and enables it to grow, yielding the familiar needle-shaped grain. The working of the ejector causes a circulation of the crystals after they have fallen into the well, which causes further growth. Nevertheless this circulation is in many cases inefficient; and we find only a small proportion of big crystals and a large amount of ungrown small crystals, which, being formed at a higher temperature than in the former case, are thin and difficult to drain.

It has been suggested that the small crystals are formed by cooling of the mother liquor after it leaves the saturator. ("Chemical Age," Dec., 1924.) Bye-products works, using direct methods of recovery, work with a higher acidity than indirect plants, and the grain is usually small; "J" in the table is a good directly-recovered salt.

With the present type of plant, it is difficult to see how the grain-size can be materially increased, although in many cases some improvement can be brought about by careful control of the saturator, though it may seem superfluous to point out this, as it is so well known. Nevertheless, it is often forgotten by the men in charge of the plant that to make a good neutral salt requires greater care than is necessary to produce good acid salt. In order to make the best grade of which the saturator is capable, the acidity of the bath should be, as nearly as possible, 2 p.ct. free acid; and this figure should be maintained. If the cracker pipe is distributing inefficiently, this may not be attainable.

Efforts to improve the salt after it leaves the saturator have been made. If the centrifugal is charged slowly with a thin stream of slushy salt, some crystal-growth takes place, and small crystals wash away. This device leads to slower working. Some form of apparatus similar to the mechanical crystallizers in use for such salts as sodium thiosulphate may be resorted to. A recent patent, in which partially-drained salt is rotated with mother liquor in a cylindrical container, appears to be on these lines. Some makers pass the salt through a screening process to remove small crystals and leave a more uniform product.

The table appearing below shows some typical sulphates graded according to size.

COLOUR.

The chief sources of colour in sulphate are: (1) Iron derived from the acid. (2) Pyridine, which distils over from the liquor. (3) Saturator scum, a black slime always present to some extent after the saturator has worked some time, which contains copper, derived chiefly from the centrifugal basket, iron sulphide and free sulphur resulting from the interaction of hydrogen sulphide with the acid, tarry matter and free carbon carried over from the liquor, and usually lead sulphate and arsenic sulphide. The following analysis is of the insoluble portion of a typical scum.

Copper sulphide	35·0 p.ct.
Iron ,,	12·2 ,,
Carbon	30·1 ,,
Tar	10·1 ,,

Iron and pyridine frequently occur together, and produce yellow and brown colours. The black scum, even though only a trace is present, imparts a grey tinge. Atmospheric oxidation occasionally improves this colour, but not if the salt has been dried by heat.

Most of these faults would be removed if the acid were purer. Some makers use a specially pure acid, and obtain a better salt which averages 25·7 p.ct. ammonia. If mother liquor, in which iron concentrates, can be taken out of circulation, some of the iron can be removed by oxidation with air, followed by filtering. During the times when the plant is not working, the saturator should be cleared of accumulated scum.

MOISTURE.

At most works moisture is reduced by means of a centrifugal followed by some form of drier. A good centrifugal, fitted with an efficient liner, should reduce the moisture to 1 p.ct. The use of woven copper wire liners is to be condemned, as these corrode more easily than perforated sheet, and become choked by fine salt. The various types of driers may be classified under two heads.

(1) Indirect driers, in which the drying is effected by surfaces heated by steam or other means.
(2) Direct driers, in which the drying is effected by means of hot air or other gas or by air at atmospheric temperature.

Driers of the first class usually involve some mechanical device for mixing the salt and bringing it into contact with the hot surface, which may be either some form of steam chest or a rotating nest of steam-tubes. In driers of this type, the salt is

Screening Tests on Sulphate of Ammonia.

I. M.M. Standard Sieves.

	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	L	M.
On 10	0·0	0·4	0·5	0·0	1·0	0·0	0·0	0·7	0·0	0·0	5·0	10·4	11·6
Through 10 on 20	0·4	11·1	2·3	0·0	4·6	2·0	0·0	6·3	0·0	0·5	56·0	87·5	71·1
,, 20 ,, 40	14·2	58·1	22·4	11·1	24·2	27·1	8·2	36·5	15·7	39·0	33·3	1·9	16·3
,, 40 ,, 60	38·9	12·6	32·9	25·7	25·1	35·0	25·9	24·4	32·3	35·1	4·8	0·0	0·8
,, 60 ,, 80	17·9	8·5	17·6	21·0	16·8	17·8	28·5	11·2	23·9	17·0	0·6	0·0	0·1
,, 80 ,, 100	15·5	3·4	8·6	13·5	9·2	6·1	12·0	8·5	12·1	4·1	0·2	0·0	0·0
,, 100	12·4	4·9	14·8	28·2	18·1	10·6	24·5	12·1	15·3	4·0	0·2	0·0	0·0
	99·3	99·0	99·1	99·5	99·0	98·6	99·1	99·7	99·2	100·3	100·1	99·89	99·9

A	Gas-Works	Circular saturator		Non-caking	F	Gas-Works	Square saturator		Non-caking
B	,,	,,	,, (Wilton)	,,	G	,,	,,	,,	Caking
C	,,	,,	,,	Slight caking	H	,,	,,	,,	,,
D	,,	,,	,,	(caked lump of salt similar to A)	I	Bye-product works direct recovery			,,
E	,,	Square saturator		Caking	J	,,	,,	,,	Non-caking

K.L.M. are "improved" salts; K has been screened; L is produced by the Mond process, where a weak mother liquor is concentrated outside the saturator; and M is the mechanically crystallized product referred to above.

heated suddenly, and subjected to a rolling and scraping action, which is detrimental to the crystals and produces dust. From some of these machines the fine dust escapes into the air, and is very troublesome.

There are various forms of the hot air drier. In some the salt falls down a tower from shelf to shelf, which may be provided with rotating arms for stirring the salt. In others the salt passes through an inclined cylindrical chamber, and is carried forward by means of an archimedean screw. The hot air passes through in counter-current, and, on leaving the apparatus, is often passed through a small acid seal to recover ammonia and pyridine.

The air is heated by passage through heated tubes, or air mixed with the products of combustion from gas burners is used. Machines of this class are to be preferred to the former, since attrition of the salt is usually avoided, and the heating is gradual, and not severe. The use of heat is altogether avoided in some cases. In these the salt after discharge from the centrifugal is separated into a shower of individual crystals by passage through jigging screens, when the natural heat of the salt is able to evaporate the surface moisture. For its efficient working, the device depends on the salt having as great a fall after passing through the screens as can be obtained in the building—say, 30 ft. Provided that the air of the store is reasonably dry, a moisture content as low as 0·1 p.ct. can be reached, and the salt possesses the advantage of being in equilibrium with the atmosphere—a point which is of importance in connection with caking. One disadvantage of the method is that pyridine, which retains moisture if present, is not so completely driven off as it is in the hot driers.

CAKING.

From the consideration of moisture, we pass to the caking trouble, which results from a loss of moisture. Moisture, as the Federation Technical Committee notes, exists as a saturated solution on the surface of the crystals, which, when drying occurs, deposits small crystals which act as a cement. It is important to notice that the cementing action occurs between faces actually in contact, so that the more points of contact between crystals, the stronger the caking when it occurs.

In experiments which have been made in which widely different grades of salt containing different amounts of moisture were exposed first to moist air and then to warm dry air, the following facts were established:

(1) Some caking took place in all cases, though the amount varied considerably.
(2) The salt containing a large proportion of well-developed crystals caked least.
(3) Where a large amount of dust and small crystals was present (passing 80 mesh) caking occurred.
(4) Where the grain was heterogeneous, varying from big crystals to very small, the tendency to cake was greater than if there was a preponderance of even-sized crystals, though this grain was small. In the first case, the free space is less, and there are a greater number of points of contact, with increased opportunity for cementation.
(5) If the crystal faces have become roughened by a too-severe drying heat, these surfaces offer a greater lodgement for moisture, and facilitate caking.
(6) The absorption of moisture is more rapid if the salt has been dried at a high temperature.

It is well known that even dry salt will cake in spite of the Federation Committee's somewhat bald statement that caking is due to loss of moisture. Perfectly dry salt very readily picks up a little moisture, which, if the physical condition of the salt is poor, will lead to caking, which may be quite as severe as if the salt had been moist in the first place. Moisture may be absorbed by the operation of several factors. The chief cause is the natural hygroscopicity of the salt. All salts which are soluble in water are influenced by the hygrometric condition of the atmosphere. Those which form crystalline hydrates occasionally present very definite reactions—as in the phenomena of efflorescence and deliquescence.

Those which do not form hydrates also absorb moisture from the air to some extent; but the quantity absorbed is indefinite, and varies with the humidity of the atmosphere. This property has been investigated for some twenty fertilizers by Beaumont and Mooney ("Industrial and Engineering Chemistry," 17, p. 635) who find that, in nearly saturated air, sulphate of ammonia absorbs 22·4 p.ct., and ammonium nitrate 29·8 p.ct. Since the ammonia content of the sulphate is given as 24·96 p.ct., this was probably acid salt. In similar experiments on neutral salt, I have obtained up to 10 p.ct. moisture absorbed. The tendency to absorb moisture is increased by the presence of dust, traces of such substances as free sulphuric acid, lime, soda, and ammonia, and pyridine, all of which substances form hydrates and are more hygroscopic than the sulphate itself.

The following figures show the effect of small crystals on the rate of absorption of moisture. The figures are of salt dried at 100° C. exposed to saturated air at 15° C.:

	Average Sample.	Portion Passing 100 Mesh.	Portion Retained on 40 Mesh.
	P.Ct.	P.Ct.	P.Ct.
Moisture absorbed after 24 hrs.	0·56	0·76	0·38
" " " 48 "	1·06	1·35	1·18

The effect of free acid and of drying temperature is shown in the following. All samples were exposed to the atmosphere for 24 hours (humidity 82):

Temp. of Drying. °C.	Neutral S/A. P.Ct.	S/A Containing 0·02 P.Ct. Free Acid. P.Ct.	
140	0·22	0·30	Moisture Absorbed.
100	0·04	0·23	
80	0·09	0·27	
40	0·07	0·09	

In view of this hygroscopicity of dry salt, it is desirable that the salt should be in equilibrium with the air of the store before it is stacked. It is particularly important that salt should be cold before it goes into store, as steam is present in warm salt for some time after it has been discharged from a centrifugal (and to a less extent from a drier), and, if unable to escape, it condenses on the salt as it cools. If the warm salt is stacked while this steam is still entangled in it, caking takes place.

If, due to any of the above reasons, moisture has been absorbed, it will be lost again when the hygrometric condition of the atmosphere alters towards a drier state, such as occurs with a rise in temperature or change in direction of the wind; and this loss probably takes place most readily during transport. The result in either case is caking either in the heap or in the bags. Since the humidity of the atmosphere is the ultimate source of the trouble, it follows that some works will experience more trouble than others, according to their geographical situation. The measures which may be taken to lessen the tendency to cake are:

(1) The exclusion of dust and small crystals as far as possible.
(2) Increasing the size of the crystals.
(3) Maintaining the store in a slightly warm condition, free from steam, and well ventilated.
(4) Aerating the salt, by allowing it to fall in a loose shower through the air. This ensures that the salt is cool and loosely packed. The air-films thus entrapped seem to persist, and hold the crystals apart even after bagging.
(5) The addition of some substance to the salt to coat the crystals and so separate them. In the case of ammonium nitrate, oil has been used for this purpose; but this does not seem practicable for sulphate.

I wish to express my gratitude to Dr. Weyman for his advice, and for suggestions freely given, in the preparation of this paper, and to Mr. Tarratt for permission to publish it.

The discussion on both papers was taken together.

Discussion.

The CHAIRMAN said the papers they had listened to were a happy combination. They had in Dr. Smith what might be termed a veteran of the gas industry; while Mr. Cummings, who made his first public appearance as a reader of a paper, laid before them the results of some very interesting experimental work. In regard to Dr. Smith's paper, cyclone extraction was rather bulky in form. The idea of the acid trap was a good one. As to benzole recovery, this depended on local conditions, and each undertaking should decide on its policy after going thoroughly into the facts and figures of the case. Personally, he thought benzole recovery was an economic proposition. Dr. Weyman said he was very much interested in the question of making sulphate of ammonia without the use of sulphuric acid, and recalled that Dr. Arthur Jacques, who was mentioned in Dr. Smith's paper, was formerly at Armstrong College. Dr. Weyman went on to say that synthetic alcohol was a proposition which would have to be considered in time. He believed the process carried out at Skinningrove was still being worked by Mr. Ernest Berry, and perhaps some day there would be large-scale results from it. In the preparation of Mr. Cummings' paper he had been pleased to give suggestions. It was an easy thing to do that, but a different matter to carry them out. While he knew with what Mr. Cummings had concerned himself, he (Dr. Weyman) had learned a good deal when he read the paper in its connected form. Speaking of the physical state of sulphate of ammonia, he said that small works should be able to produce a salt as good as that made on large works, without any great trouble. It occurred to him that mechanical driers where salt was heated should not be run in series but in parallel. Salt was very susceptible to change by slight elevations in temperature. It did not matter much what the actual size of the crystal was, if there was little dust.

Mr. J. E. ANDERSON (Willington Quay) said both papers dealt with problems inside the walls of gas-works. A difficulty was that any extra attention given to one particular object in the works was apt to lead to partial neglect of others, at least for the time being. The papers read represented investigations of certain problems, and they offered to those who read the papers an opportunity of using conclusions arrived at. Dr. Smith had touched upon the provocative question of the recovery of benzole. The speaker would like to say, with the Chairman, that benzole extraction did pay.

Mr. T. NICHOLSON (Willington, Durham) remarked that the hygroscopicity of sulphate of ammonia was an important factor. The British Sulphate of Ammonia Federation required the moisture to be reduced to a very low limit; and he thought their investigations should go forward to prove definitely whether such a low limit could be maintained. The salt left this country as dry; but would it remain so till it reached a foreign port?

Mr. F. NICHOLLS (Gateshead) said that on a fair-sized benzole plant it should not be difficult to make motor spirit at a cost of about 4d. per gallon. On the question of salt caking, he said they would get caking wherever the conditions were definitely favourable to increase of moisture.

Mr. T. WESTHORPE (Tangley Park) said that it seemed of little use to go to extreme dryness at this end if there was no guarantee that the customer abroad would get it in the same degree. There was little to be gained in laying down plant to produce an article which was negatived by transport conditions.

Dr. SMITH, replying to the discussion, said the cyclone extractor was an apparatus which did not throw back-pressure. As one who strongly believed in selling gas at differential rates—the selling of big quantities for industrial purposes at low rates—he agreed that one should get profit from a residual so long as one could prove that there was a profit. They might say that benzole recovery meant a loss in the gas of about 1¾ therms, and if the gas was worth 9d. a therm, this represented about 1s. 3d. The selling price of benzole retail was (say) 1s. 9d. per gallon, so that if they put that into terms of gas per therm, it would represent about 1s. The cost of distribution was about 5d. and the coal (say) 3d. per therm, and thus they would see there was not much in it. From every point of view, whatever they got from gas must be put against the cost of coal. In Newcastle there was an overwhelming case for the extraction of benzole. In regard to sulphate of ammonia, he was not satisfied that the direct recovery of ammonia was cheaper than the indirect recovery *plus* the acid catch.

Mr. CUMMINGS also briefly replied to the discussion.

On the motion of Mr. W. BALL (Newcastle), seconded by Mr. J. SMITH (Consett), a vote of thanks was accorded to the readers of the papers.

MIDLAND JUNIOR GAS ASSOCIATION.

Opening Meeting.

[The importance of accurate sampling is not always appreciated. When the subject of chemical control is being discussed, the preliminary step of any analysis—that of sampling—is too often either lost sight of or dealt with lightly. This is strange when it is considered that all subsequent steps depend on the accuracy of sampling. Realizing this, Mr. J. H. Gee, B.Sc., has devoted the major portion of his Presidential Address to the subject, and has some excellent information to impart on the sampling of coal, spent oxide, ashes, tar, and gas.]

The Opening Meeting of the session was held at the Birmingham Council House on Thursday, Oct. 29. The chair was occupied at the outset by the retiring President, Mr. HARRY CLARK, of Derby, who mentioned the interesting fact that this was the 21st anniversary of the Association.

Mr. CLARK announced that the Council had elected Mr. H. R. Hems (the Hon. Secretary) Junior Vice-President. No one more richly deserved the honour.

Mr. J. H. GEE, B.Sc. (Senior Works Chemist, Central Laboratory, Nechells), this year's President, then took the chair—Mr. Clark testifying to his active interest in the work of the Association.

The PRESIDENT then moved a vote of thanks to Mr. Clark for his services during the past year. The work of the Association was extremely successful; and to this success Mr. Clark, who had never spared himself, made a worthy contribution. His Presidential Address was virile, and aroused a good deal of comment in the Technical Press.

The resolution of thanks was seconded by Mr. C. F. TOOBY, of Coventry (Senior Vice-President), and cordially passed.

Mr. CLARK, in acknowledgment, said it had been to him a pleasure to give service.

Mr. GEE then delivered his address, the opening part of which was devoted to outlining the activities and progress of the Association since its inception in 1905. From the address the following is extracted.

PRESIDENTIAL ADDRESS.

ROUTINE GAS-WORKS TESTS.

Bearing in mind that ours is a Junior Association, and that many of our members are concerned wholly or partly with routine gas-works tests, I felt that a few details connected with the more important routine tests would be of value, particularly to the younger section of the members. I do not profess to add anything new to gas-works testing. It is my intention rather to emphasize those pitfalls and sources of error met with in some of the more important tests. Much that I have to say is of an elementary character, and, of course, most of the pitfalls are avoided in a well-conducted laboratory; but I fear that this is not invariably the case, more particularly where staff is limited and scarcely the minimum time is available for carrying out the tests.

SAMPLING.

Before a test is carried out, it is most important to obtain a sufficiently representative sample of the material to be tested. The precautions necessary, if a representative sample is to be obtained, are not always appreciated by juniors. Even where a suitable method of sampling and reducing is used, the junior is frequently in the dark as to the reasons for the various operations.

The basic theoretical consideration of sampling involves somewhat complicated mathematics. Those of you who are mathematically inclined will find of interest a paper by Martin L. Griffin to the New England Section in the Journal of the Society of Chemical Industry for 1909, p. 193. This was entitled "A Mathematical View of Sampling, with reference to the Degree of Accuracy to be obtained," and gave a probability curve, and an equation representing this curve, for a particular example of sampling leading to some very interesting general conclusions.

As an example, showing the need for extreme care in sampling, I propose to outline broadly the generally accepted methods of coal sampling, having regard chiefly to the considerations upon which the methods are based.

COAL SAMPLING.

A suitable method of sampling deliveries of coal has been worked out in the United States of America by the Bureau of Mines, and is to be found in Bulletin No. 116 (G. S. Pope).

Based on the fundamental principles of sampling as stated by Bailey in 1910, the Bureau of Mines gives particulars as to the size of gross sample required, and the sizes to which a sample should be crushed at its various stages of reduction of quantity, pointing out that the quantity of gross sample to be taken depends on the character and condition of the coal to be sampled, and not on the quantity to be sampled. They also recognize the principle that the weight of the largest piece of impurity should be relatively very small in ratio to the weight of the sample at each halving. Bailey worked on coal containing 5 p.ct. of ash. The fundamental principles of sampling mentioned above are briefly as follows:

(1) The greater the bulk ratio, the greater the probability of obtaining a representative sample. The bulk ratio is the fraction:

$$\frac{\text{Weight of sample.}}{\text{Weight of material in bulk.}}$$

Bailey gives the following table:

Bulk Ratio.	P.Ct. Error between Sample and Bulk.
1 100	1·4
2 100	0·8
5 100	0·6

(2) The smaller the size ratio, the more likely is the sample to be a representative one. The size ratio is the fraction:

$$\frac{\text{Weight of largest pieces in sample.}}{\text{Total weight of sample.}}$$

Bailey found that if the error of sampling was to be less than 1 p.ct., the following table must be adhered to:

Relation between Fineness of Bulk Material and Size of Sample

Weight of Largest Pieces in Lbs.	Amount of Sample in Lbs., not less than—
6·7	39,000
2·5	12,500
0·75	3,800
0·38	1,900
0·24	1,200
0·12	600
0·046	230
0·018	90

(3) *Quartering.* Bailey found that to obtain an accuracy of 10 p.ct. it was necessary to reduce the sample before quartering, according to the following table:

Relation between Fineness of Sample and Bulk of Material.

Weight of Fraction in Lbs.	Size to be Crushed. Diameter in Inches.
7500	2·0
3800	1·5
1200	1·0
460	0·75
180	0·5
40	0·425 (7/2 mesh)
5	0·20 (4 ,,)
0·5	0·1 (8 ,,)
0·25	0·076 (11 ,,)

The particular difficulty in coal sampling is that the pieces of shale usually consist of 100 p.ct. impurity, and consequently the inclusion of an incorrect proportion of shale would have an enormous effect on the accuracy of the sample.

Bulletin No. 116 directs that the gross sample shall be from 1000 to 1500 lbs., according to the nature of the coal, and gives a similar table to the one quoted above.

Size of Coal and Quantity Required for each Reduction.

Largest Size of Coal and Impurity Allowable in Sample before Division.	Weight of Sample to be Divided, in Lbs.
1 inch	1000 (or more)
¾ "	500
½ "	250
⅜ "	125
¼ "	60
1/16 "	30

I have dealt with the principles underlying coal sampling in detail because the same principles are involved in the sampling of any solid material—*e.g.*, coke, spent oxide, new oxide, lime, ashes.

The quantities may not require to be so large, but there is the same need to collect a sufficient bulk sample in an impartial manner, and to grind it sufficiently fine at each stage of the reduction before the process of coning and quartering. It is a waste of time to mix, cone, and quarter without having previously ground the sample after the previous quartering operation.

Sampling of Spent Oxide.

Great care is needed in taking samples of spent oxide, since different parts of a heap may contain very different proportions of sulphur, even though the heap comes from one purifier. The lumps are usually richer in sulphur than the fines; and it is therefore necessary to see that a fair proportion of each is included in the bulk sample.

The National Gas Council, in their official method for the testing of spent oxide, give detailed instructions as to the collection and treatment of samples; pointing out that discrepancies in the past have been due more to faulty sampling than to errors of analysis. It is surprising, however, that a minimum bulk for the specified sample is not stated in this pamphlet, since, as appears from Bailey's observations, the bulk ratio is of great importance. A bulk sample of approximately 1 cwt. per 8 tons of oxide sold represents sound practice. This should all be crushed to pass a ¼-in. sieve, and the daily portion to be set aside in the air-tight receptacle should be approximately 10 lbs. in weight. If you are set to sample a heap of oxide as it stands, collect a large sample (say) 5 to 6 cwt. from all parts of the heap, and crush and reduce this with great care. Excessive care is needed if the heap is one that has fired.

New oxide is more easily sampled than spent oxide, since it is usually of a uniform and small grain size. Thorough mixing, coning, and quartering of a well-chosen bulk sample should suffice. The bulk sample should weigh from 30 to 40 lbs. for a truck of 5 to 6 tons.

Sampling of Ashes.

Ashes are very difficult to sample with accuracy. Consider, for instance, the difference in density between the unburnt coke and the fused clinker. This will cause errors to creep in during the coning and quartering operations. If an accuracy even approaching that obtained in the best coal sampling is desired, it is obvious that a large bulk sample must be collected with impartiality, and the reducing operations must be carried out with the utmost care. A bulk sample of approximately ½ cwt. per ton, smashed down to 1 in. size before the first reduction, would appear to be the minimum when sampling large hoppers or heaps of (say) 200 tons or over. Of course, if smaller heaps are to be sampled, the proportion would need to be higher.

Sampling of Tar.

For determination of liquor content, if the tar is not covered with an excessive quantity of separated liquor, a sectional tube sampler furnished with a valve at the bottom provides a representative sample. It is necessary to lower the tube into the liquid slowly, and as many positions as possible should be sampled. This method is useful for boats or tanks not more than 4 to 5 ft. in depth. For larger tanks probably the best method is to take a generous, intermittent drip sample from the pipeline while the tank is being emptied or filled. A petcock opened full-bore to give (say) half-a-gallon sample for every 6 in. of a tank 150 gallons per inch can be taken as an indication of what is necessary. Slow running continuous drip samples are usually very inaccurate for mixtures of tar and liquor.

As a substitute where such a method as the above is not feasible, the tar should be well agitated (say) by compressed air, or preferably by a mechanically driven paddle, and the sample quickly taken with a ladle. It should not be overlooked that prolonged use of compressed air may affect the proportion of volatile constituents in the sample.

While on the subject of tar and liquor, I will remark that a close study of the system of tar and liquor separation on any of your works would probably be well worth while. It is becoming more and more evident that the tar should be separated from the liquor at the earliest possible moment, more particularly where steaming in verticals is carried out. The paper contributed by Dr. Lewis Bailey—the Chief Alkali Inspector—to the Institution of Chemical Engineers last July shows that colour-producing phenolic bodies of high oxygen absorption power are transferred from the tar to the liquor when the two are allowed to remain in contact, and subsequently give trouble when the effluent liquors from the ammonia stills have to be disposed of. Further, the prompt separation of tar and liquor while they are hot cannot but lessen the formation of those more or less permanent emulsions with which some of you have to deal.

Sampling of Gas.

The sampling of pure gas does not appear to present any very great difficulty. The following points should, however, be noted:

(1) It is necessary to make certain that the sampling point on the main gives the desired gas suitably mixed. Where the flow of the gas in the mains is likely to consist of differing parallel streams, as (say) after the meeting of two supplies of gas at different temperatures, it is desirable to sample the total diameter of the main by means of a perforated sample tube at right angles to the direction of flow.

(2) It is undesirable to rush the sample through long lengths of pipe at various velocities, since this way may have uncertain effects on the composition of the sample.

(3) If a collected sample from a varying stream is aimed at, and the period of collection and mixing is short (say, one to three hours), it is desirable to have some means of mixing the sample in the holder.

(4) In the case of smaller installations which have varying makes, and where the quality of the make also varies considerably, some method of collecting an average sample at a rate proportionate to the actual volume made would appear desirable when the sample is to be used to estimate thermal yields.

In this connection it is interesting to note that Prof. Boys pointed out at the Institution meeting that his clock-sampler for town gas could be set to collect at pre-determined rates roughly proportionate to estimated output. The apparatus, however, did not appear to be capable of giving gradual automatic variations proportionate to output.

The accurate sampling of hot, crude gases is a more difficult matter. Condensation must be prevented during the sampling operation; alternatively the products of condensation must be collected and tested in addition to the gas. As examples, take the sampling for the estimation of naphthalene in gas more or less saturated with this constituent.

(*a*) At outlet of coal gas purifiers. Temperature of gas in main, 15° C. Atmospheric temperature, 0° C. It is evident that the temperature of the test box must be kept at 15° C. as a minimum, and condensation of naphthalene prevented, whether in the sampling tube or in the oxalic acid wash bottles. Otherwise the naphthalene absorbed in the picric acid wash bottles certainly will not represent the proportion in the main.

(*b*) At the outlet of the tar extractors, in a heavily carburetted water gas. The gas has probably a temperature of 30° to 35° C., and contains oil and tar fog in suspension. It is not possible to sample this gas without condensing out the tar fog. The condensate must be collected separately, and the naphthalene content thereof added to that of the cooled gas estimated in the usual way.

Examples might be multiplied, but enough has been said to show the need for preventing condensation during sampling, particularly where soluble constituents like CO_2, H_2S, and NH_3, or easily condensable constituents such as water vapour or naphthalene, are to be determined.

Routine Gas Analysis.

Mr. Gee then went on to deal in detail with the routine analysis of gas, including the determination of the specific gravity and calorific value. With regard to the latter point, he outlined carefully the method to adopt if it is found that discrepancies arise when the calorific value of a gas is determined by two different sets of apparatus. Every junior, said Mr. Gee, should make himself familiar with the Notification of the Gas Referees, and with Circular No. 36 of the United States Bureau of Standards on "Industry Gas Calorimetry."

Mr. TOOBY, in moving a vote of thanks to the President, congratulated him upon the excellence of his address. He hoped that in this "majority" year a supreme effort would be made to improve the attendance of members at the meetings.

The resolution was seconded by Mr. HEMS, and supported by Mr. C. F. W. RENDLE (Redditch). There was urgent need, Mr. Rendle said, for the newer members of the Association to come forward and make contributions to the proceedings. He regretted that a larger number of papers had not been given on chemical and structural engineering subjects.

Mr. T. F. E. RHEAD (Chief Chemist, Birmingham Gas De-

partment) believed it would be found that the Association had made right choice in electing Mr. Gee. He had worked with him for eleven years, and could testify to his dogged, persistent, and careful work. It was a matter for satisfaction that he had stressed the question of correct sampling. It was what was called a "dirty job," and had to be done under difficult times and conditions; and he thought it was not always done so well as it might be.

Mr. W. J. PICKERING (Birmingham Coal Test Works) expressed the hope that the junior members would develop a more healthy idea of their own importance, and come forward in greater numbers to give papers.

The resolution was carried, and the PRESIDENT briefly replied.

Afterwards the members paid a visit of inspection to the new showrooms of the Department in Paradise Street; but before doing so, Mr. G. M. Lewis (Showroom Manager) gave details of the new depot; one of the chief assets of which was, he said, an excellent display window in the leading thoroughfare. The idea was to provide a permanent exhibition. The rooms were described by Mr. B. W. Taylor.

SCOTTISH JUNIOR GAS ASSOCIATION.

[At this meeting Mr. Forshaw details tests which confirm the popular view that high aeration is desirable in a gas fire The radiant efficiency, he states, is improved with every addition to the primary air up to the maximum quantity possible to entrain with present-day burners. It is only when air is forced into the burner, and the possible natural maximum aeration is thus exceeded, that the radiant efficiency is adversely affected.]

The Annual Joint Meeting of the Eastern and Western Districts of the Scottish Junior Gas Association was held in the Royal Technical College, Glasgow, on Nov. 7, when Mr. Arthur Forshaw, M.Sc., Chief Chemist to Messrs. R. & A. Main, Ltd., of Falkirk, read a paper on "Gas Fires."

Mr. ROBERT GRAY (Hamilton), President of the Western District, who took the chair, extended to the Eastern members a cordial welcome to Glasgow, and said that, as such meetings brought the junior members into closer touch, they would help to solve their difficulties. He had great pleasure in introducing to the members Mr. Forshaw.

Mr. FORSHAW thanked the Associations for this opportunity of speaking to the junior members, and proceeded to give his address.

GAS FIRES, WITH SPECIAL REFERENCE TO AERATION.

When one is asked, after over sixteen years spent in research directed to the improvement of gas appliances, to read a paper before so important a body as the Scottish Junior Gas Association, one begins to wonder whether its members, confronted as they are with gas fires that have been brought to a state of considerable refinement, realize what a vast amount of work has been done in the past in order to enable them to have at their disposal the present effective, yet apparently simple, appliances.

On the answer to this query depends the usefulness of a paper such as this. If junior engineers are content to take things as they find them, without any particular desire to know any of the steps by which the modern gas fire has been perfected, information such as I propose to offer will be hardly of passing interest. On the other hand, I am optimistic enough to believe that the invitation to address you means that some idea of the methods adopted in gas appliance research laboratories, as exemplified in an account of one particular inquiry, will be appreciated not entirely because of its conclusions, but also because it shows how a subject develops as it is tackled, and how difficulties arise and are dealt with during the course of investigation. This leads me to say that the more we have the opportunity, as representatives of different sides of the gas industry, of seeing each other's difficulties, the more we shall appreciate them, the more we shall work in harmony, and the better it will be for individual interests and ultimately for the industry at large.

In the gas fires of twenty years ago, a very usual form of burner was of oval shape, with two inlets for gas, caused by cutting the oval on the side remote from the burner teats. The injector took the form of a tee, the two opposite ends of which discharged through suitably-drilled nipples into the two ends of the burner. The teats themselves were somewhat large, and the holes in them, being cored-out and not machined, were not of invariable dimensions. In these circumstances, the individual flames were frequently not of equal length, and the aeration of the two sides of the burner might also be unequal. As the fire was several inches deep from back to front, and the space was filled with hollow fireclay balls, this did not matter a great deal. Even with all the possible inequalities of flame and aeration the fires became very hot in appearance, and the inequalities evened-up as the flames mixed in the incandescent mass of fireclay. With the introduction of shallow fires with upright radiants, each heated by its own flame, the case was altered, and the type of burner described was no longer permissible. For the even heating of the new fires, equality of length was the first essential of the flames; and burners had to be made with one inlet and with more intricate internal passages designed to equalize the flow of gas to the various teats, which, in their turn, were drilled out, instead of being cored in the casting. In this way equality of length was achieved, though I can remember as late as 1910-12 a fire burner which, owing to its poor internal design, delivered more gas to one teat than to the others, and to remedy the defect its makers drilled that teat with a smaller drill than the others. They certainly made their flames equal in length, but the particular flame mentioned was then not bulky enough, and the radiant it supplied was always poorly heated compared with the rest of the fire.

Having in general solved the problem of equal flames, the further problem of aerating them now became pressing. Without reference to the thermal efficiency of the radiated heat, it was obvious that aerated flames gave a brighter and more effective-looking fire; but progress in this direction was held up by three disadvantages that became evident—viz., noise of the flames, noise at the injector, and liability to light-back. It was, of course, known that the first and third could be practically eliminated by the use of gauze in the burner; but this led to other disadvantages which only showed themselves later on when the gauze became choked with dust and the back-pressure in the burner became so great that the flames might become actually luminous through the failure of the gas issuing from the injector to entrain the necessary primary air. It would be too long a story to show in detail how all these various problems of noise, dust, and so on, were solved, but that they were is, of course, common knowledge.

All this time the great majority of those connected with the manufacture and sale of gas fires believed that high aeration was an advantage not only to appearance, but also with regard to thermal efficiency. There arose, however, dissentients from this view, as the following quotation will show: "High aeration is not essential to the successful working of a gas fire, nor, so far as our present knowledge of the subject allows us to say, is it advantageous."*

Figures were given in support of this statement which were said to "indicate that the change in radiant efficiency, if any, is rather a decrease with the adoption of a highly-aerated flame in the ordinary gas fire." The figures were:

		P.Ct.
Fire A.	High aeration . . .	46·6 efficiency
		46.8 ,,
	Low aeration . . .	48·7 ,,
		49·0 ,,
Fire B.	High aeration . . .	44·3 ,,
	Low aeration . . .	44·2 ,,

Sufficient details of the above tests were not given to afford material on which to found some other possible explanation of the increased radiation from Fire A when the aeration was reduced, while Fire B shows little difference between high and low aeration.

It seemed to me that so important a point should be put to more exhaustive proof than that advanced above, particularly as, if the statement quoted were found to be justified, it would relieve gas appliance makers of the necessity of spending time and money in attempting to aerate their fire burners, to no useful purpose. The matter was therefore taken up in the following manner: A fire was selected with seven radiants and provided with a burner designed to be capable of the highest possible aeration of the flames. Further to promote this object, an injector was used from which the requisite gas stream issued at as high a velocity as possible in order to entrain the maximum quantity of primary air. Owing to several features capable of alteration with advantage to the radiant efficiency, the fire as a whole gave somewhat low results, and those quoted should not be regarded as representative of the performance of the best modern fires. This fact does not affect the work under discussion, which was concerned solely with the effect of varying the aeration.

The procedure adopted was to set the consumption in B.Th.U. per hour, and to determine the radiant efficiency with the flames at the maximum aeration afforded by the particular combination of burner injector. The test was then repeated with the primary air reduced until the flames were "lazy" and just non-luminous. No quantitative measurements of the entrained air were at first attempted. After each pair of tests was complete, the injector was changed for one of higher consumption, and the tests were repeated. In this way the whole probable range of consumption within which a gas fire is likely to function in practice was covered.

For the sake of comparison, the results in the third column have been calculated for an assumed calorific value of 500 gross B.Th.U. per cent. As a matter of fact, the gas actually used was not only of a lower calorific value than this, but was

* H. Hartley, "GAS JOURNAL," Nov. 16, 1915.

TABLE 1.

Aeration.	B.Th.U. per Hour (Net.)	C.Ft. per Teat of 500 B.Th.U. Gas.	Efficiency.
Low	10,600	3·37	42·0
High	10,370	3·29	44·9
Low	11,080	3·71	44·0
High	12,010	3·81	49·7
Low	12,390	3·93	42·3
High	12,280	3·90	44·2
Low	14,130	4·48	41·9
High	13,570	4·31	42·3
Low	14,450	4·59	42·9
High	13,550	4·30	46·4
Low	15,140	4 79	37·6
High	15,010	4 76	43·0
Low	15,470	4·91	41·3
High	15,550	4·94	42·2
Low	16,910	5·37	37 7
High	16,900	5·36	39·5

also of very inconstant quality; and this accounts for the differences between the B.Th.U. used in each pair of tests, for the other conditions—viz., of pressure and of injector orifice—were kept the same. In spite of this disadvantage, it will be observed that in every case the more highly-aerated flame affords an increased radiant efficiency; and so far the general belief would appear to be justified.

Another set of tests carried out in a rather different manner, and with a fire different in nearly every detail of shape, burner, brick, and radiants, gave equally convincing results. In this case no attempt was made to check the aeration of the flames by means of the primary-air inlet. Use was made of the fact that at higher pressure a given quantity of gas will entrain more primary air than at lower pressures. A set of five tests was carried through in which the pressure was kept constant at 2 in., the flame being aerated as it came—*i.e.*, less aerated as the gas rate was increased. This was followed by a similar set in which, starting with a higher initial pressure of 3 in., the gas rate was increased by raising the pressure progressively up to 5·8 in. The results are shown in Table 2, and graphically in fig. 1.

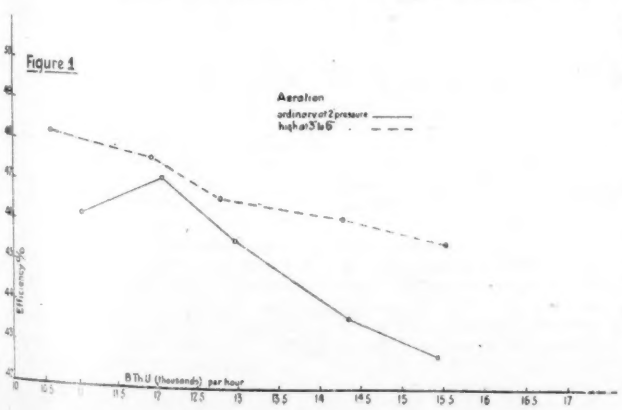
TABLE 2 (*and Fig.* 1).

Ordinary Aeration at 2 In.		High Aeration at 3 to 5·8 In.	
B.Th.U. per Hour.	Efficiency, P.Ct.	B.Th.U. per Hour.	Efficiency, P.Ct.
11,010	46·2	10,570	48·2
12,050	47·1	11,920	47 6
12,970	45·6	12,780	46 6
14,360	43·7	14,290	46·1
15,440	42·8	15,530	45·5

Here again, with this very different fire, in every case the more aerated flame gives the better result, and, as might have been expected, the difference in its favour grows as the rate is increased, owing, no doubt, to flame escaping from the top of the radiants with high consumption at ordinary aeration.

Both these sets of experiments give conclusive results, and confirm the general opinion that increased aeration of the flames increases the percentage of radiant heat emitted by a gas fire.

It was then decided to extend the research in an endeavour to get some quantitative idea of the amounts of primary air actually entrained under the above conditions. As a preliminary, a burner was prepared, for the first fire above, with a small side tube by means of which samples of the mixture could be taken from the burner immediately below the point of combustion. If the gas used is free from oxygen, the aeration of the mixture may be calculated from its oxygen content. If, on the contrary, the gas itself contains oxygen, both gas and mixture must be analyzed before the number of volumes of air entrained per volume of gas can be ascertained. Unfortunately the latter was found to be the case, the oxygen in the gas varying from ¼ to 1¼ p.ct. at different times, with, on one occasion, an exceptional maximum of 4 p.ct.



In these circumstances each test entails two analyses, from which the number of volumes of air entrained per volume of gas may be calculated from the expression

$$\frac{\text{(P.ct. oxygen in mixture} - \text{p.ct. oxygen in gas.)}}{\text{(P.ct. oxygen in air} - \text{p.ct. oxygen in mixture.)}}$$

A set of radiation tests was carried out with the flames well aerated. During each individual test samples of gas and of mixture were taken continuously at a regular rate by means of sampling vessels of the mariotte bottle type. (I need hardly say that some device of this sort is essential to ensure absolute regularity of sampling.) During the set of tests the pressure was kept constant at 2 in. at the injector, and the latter changed for a larger size to obtain the increased consumption. The results are shown in Table 3.

TABLE 3.

B.Th.U. (Net) per Hour.	Radiation, P.Ct.	Vols. Air per Vol. Gas (A/G).
11,340	45·05	2·72
12,560	45·87	2·68
14,440	44 69	2 24
15,040	44·93	2·27
16,440	43 68	1·87

These results show a steady decrease in the A/G ratio as the gas rate is increased, with one exception—at 14,440 B.Th.U. per hour. No cause can be definitely assigned for this, unless it be due to the calorific value, which was higher by some 3 to 4 p.ct., or unless that particular injector, through some small irregularity of surface, was not so efficient. A repeat analysis gave a figure of 2·27 A/G. The radiant efficiency is also lower than would be expected from the results above and below it.

These tests enabled two conclusions to be made—viz., that the analysis method, while necessary in arriving at information as to the natural quantity of air entrained, was very cumbrous in practice, and would necessitate the expenditure of a great deal of time if a complete range of tests was to be carried through. Further, that as the results already obtained seemed to be reasonable and, in the main, in good agreement among themselves, they could be taken as a basis of further testing. (It should be noted that the main objection in view was the determination of the effect of aeration on the radiant efficiency, and not that of the entraining power of combination of burner and injector.)

It was decided then to devise some means of supplying measured quantities of primary air to the burner, these quantities to be based on the analysis already recorded. I had dealt with a similar problem in work on the candle-power of incandescent burners,* but now the problem was simpler, as mixtures with a high rate of back-fire were not in contemplation.

A new burner was used with its inlet end made so that air could be passed in through a large meter from a supply under pressure. A gauge was provided so that this air should be approximately at atmospheric pressure at the burner inlet, though this does not greatly matter. As with the gas meter, readings of the air meter were taken periodically during the tests, to ensure that the rate remained constant at its original setting.

The scheme of investigation adopted with this burner was to set the gas rate by means of a definite size of injector at 2 in. pressure. The air was then set to some rate smaller than that found in the tests in Table 3 to be the natural rate of entrainment. The radiation was then determined. Afterwards the air-rate was altered some four times for each gas rate.

In order to keep the number of tests within reasonable limits, the number of different gas rates was fixed at three—viz., low, medium, and high, or approximately 11,000, 13,000, and 15,000 B.Th.U. per hour. This made a programme of fifteen radiant efficiencies, which was increased to forty-five by the inclusion of similar sets of tests with each of two other burners which differed only in the size of the hole drilled in the teats. Any effect of this increase in the size of the teat diameter is due to broadening and shortening of the flame, and not to an increase in the aeration, which is fixed under the conditions of the experiments to that supplied through the meter.

Owing to the inconstant quality of the gas, the number of B.Th.U. consumed per hour did not remain constant throughout the whole series, though the pressure and nipple injector remained unchanged for each of the three sets at low, medium, and high consumption. For this reason, in expressing the results, the A/G ratio is not of exact significance. Consequently the ratio air/B.Th.U., or its reciprocal B.Th.U./air, has been calculated. It is to be noted that were these ratios to attain values of about 0·0095 and 105·1 respectively for gas of the composition used, the mixture would be capable of complete combustion without further, or secondary, air.

The curves based on these numbers well illustrate the effect of aeration. It will be seen at once that, as aeration is increased, the radiant efficiency increases up to a point represented approximately by the figure 0·005 to 0·006 c.ft. of air per B.Th.U. (that is, roughly 2¾ to 2¾ c.ft. of air per c.ft. of

* Trans. Inst. Gas Engineers 1909, p. 205.

TABLE 4 (*and Fig. 2*)—*Teats $\frac{9}{32}$ in. Diameter.*
[A—Low. B—Medium. C—High Gas-Rate.]

	B.Th.U. (Net) per Hour.	Air / Gas.	Air / B.Th.U.	B.Th.U. / Air.	Radiant Efficiency.
A.	10,100	2·05	$5·516 \times 10^{-3}$	181·3	45·55
	9,906	2 44	6·650	150·4	44·14
	9,629	2·75	7·747	130·8	44 43
	9,723	2·95	8·136	122·9	42·04
	9,579	3·25	9·109	109·7	41·97
B.	12,180	2·0	4·539	220·3	46·83
	12,260	2·24	5·499	181·9	46·98
	12,430	2·45	5·917	169·0	47·76
	12,320	2·78	6·784	147·4	46·69
	12,180	3·13	7·623	131·2	44 43
C.	13,360	1·61	4·621	216·4	43·90
	13,400	1 81	5·190	192·7	45·39
	14,950	2·60	5·541	180·5	44·87
	14,860	2·26	6·243	160·2	44·91
	14,880	2·59	7·109	140 7	43·10

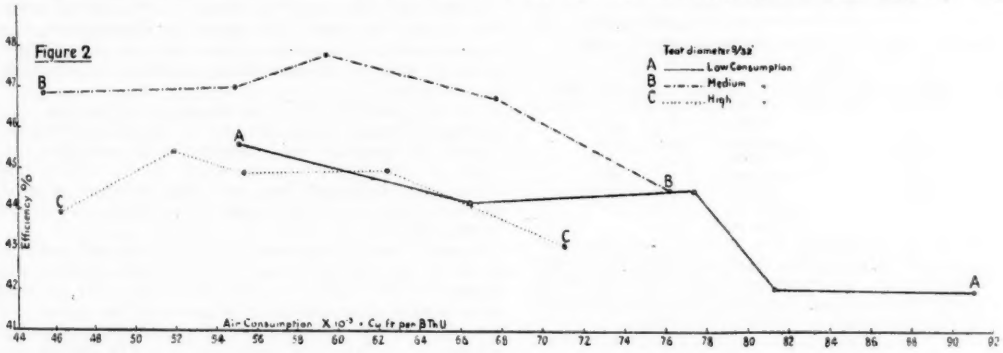
TABLE 5 (*and Fig. 3*)—*Teats $\frac{5}{16}$ in. Diameter.*

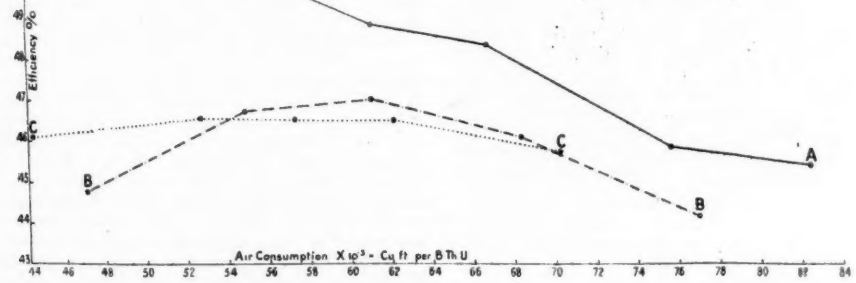
	B.Th.U. (Net) per Hour.	Air / Gas.	Air / B.Th.U.	B.Th.U. / Air.	Radiant Efficiency.
A.	11,040	1·72	$5·265 \times 10^{-3}$	189·8	50·66
	11,270	2·02	6·109	163·7	48·77
	11,290	2·22	6·675	149·8	48·36
	11,150	2 47	7·568	131·8	45·85
	11,430	2 77	8·243	121·4	45·40
B.	12,950	1 99	4 704	212·6	44 79
	12,700	2·30	5·486	182·3	46·74
	12,500	2·58	6 109	163·7	47·03
	12,500	2·87	6·837	146 2	46 08
	12,470	3·23	7 702	129·8	44·16
C.	14,520	1 79	4·432	225·6	46·09
	14,290	2 12	5·268	189·8	46·58
	14.440	2·29	5·731	174 5	46·54
	14,260	2·48	6 217	160·9	46·53
	14,280	2·80	7·028	142·3	45·74

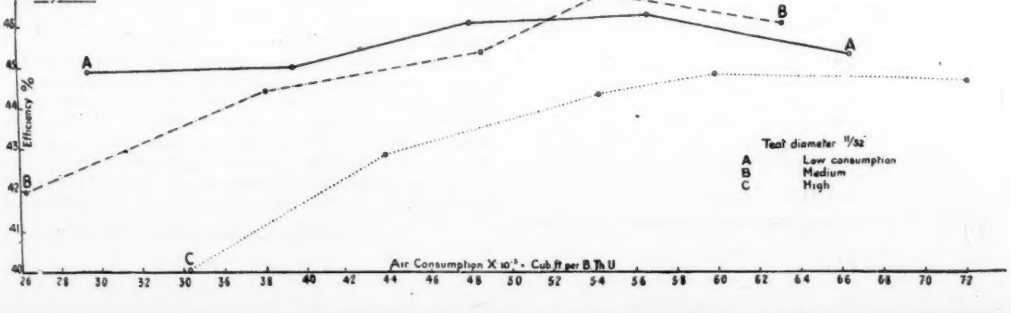
TABLE 6 (*and Fig. 4*)—*Teats $\frac{11}{32}$ in. Diameter.*

	B.Th.U. (Net) per Hour.	Air / Gas.	Air / B.Th.U.	B.Th.U. / Air.	Radiant Efficiency.
A.	10,470	1·24	$2·950 \times 10^{-3}$	339·0	44·92
	10,820	1·69	3·947	253·4	45·02
	10,570	1·99	4·810	207·9	46·06
	10,370	2·39	5·676	176·2	46·22
	10,420	2·78	6·650	150·4	45·25
B.	12,950	1·14	2·625	381·0	41·97
	12,900	1·66	3·813	262·3	44·43
	12,980	2·15	4·864	205·6	45·35
	12,980	2·40	5·461	183·1	46·76
	12,950	2·78	6·325	158 1	46·04
C.	14,870	1·54	3·431	291·4	40·10
	15,010	1·98	4·389	227 8	42·87
	15,040	2·45	5·432	184·1	44·30
	14,860	2·67	5·998	166·6	44·80
	14,700	3·20	7·216	138·6	44·64

500 B.Th.U. gross gas), after which the efficiency falls away with a further increase in the amount of air. The only partial exception to this is shown by the low consumption curves in figs. 2 and 3, whose maximum is at a somewhat lower proportion of air. The reasonable explanation of this is that at low consumptions it is necessary to have a flame on the verge of being luminous, otherwise its bulk is so small that it does not make effective contact with the surrounding radiant (the analogous case of too large an incandescent mantle on a lighting burner shows exactly the same result in light emitted). As the aeration is increased, the flame shrinks, and the efficiency follows suit. So far as these partial exceptions affect domestic practice, it is to be noted that such low consumption would only occur when a fire was turned down, for the user naturally asks for a fire brightly heated to the top, and if it were set with a low maximum consumption it would either be dully red at low aerations, or, if made brighter by increasing the aeration, the incandescence would not extend to the upper part of the radiants. What these exceptions show is that in cases where pressure is so low that low consumptions only are possible, then the best radiant efficiency is obtained by adjusting the air so







that the radiants are more evenly heated, even if thereby they are not so bright in appearance.

In general, the tests fully confirm the popular view that high aeration is desirable in a gas fire, for the radiant efficiency is improved with every addition to the primary air right up to the maximum quantity possible to entrain with present-day burners. It is only when air is forced into the burner, and the possible natural maximum aeration is thus exceeded, that the radiant efficiency is adversely affected.

While this is the main result of the investigation, there are several other facts that emerge from a study of the results; and of these the one most worthy of mention is the influence of teat area. It seems fairly clear that the old $\frac{1}{8}$ in. diameter hole in the teat, which was generally in use for some years, is not so good as the larger $\frac{7}{64}$ in.; and, as a matter of fact, most gas fires to-day will be found provided with the latter. It is interesting to note the reason for the change, which was to obtain higher aeration, and the reason why the larger size was not adopted in the first instance, which was principally because, with a well-designed burner and injector, the increased aeration due to the change caused flame noise, which originally had not been dealt with in a permanently satisfactory manner. That the change was in general one for the better is proved by the results I have put forward.

In conclusion, I wish to express my thanks for this opportunity to put the results of this research before the gas industry.

Mr. ALLAN CLARK (Perth), President of the Eastern District, thanked the Western friends for the reception. In thanking Mr. Forshaw for his address, he said that when comparing the gas fire of (say) 18 years ago with the fire of to-day, they at once realized how much they were indebted to men like Mr. Forshaw, who had devoted so much time to research work in order to produce the scientific fires which were on the market to-day.

Mr. J. MCGHEE (Glasgow) remarked that the work of perfecting the gas fire had taken years of patient endeavour; and he thought the gas industry was indebted to the appliance manufacturers for the expense they had incurred, and also to men such as their speaker that day for the progress made.

Mr. FORSHAW then proceeded to answer questions on points not covered by his paper; and at the close Mr. GRAY moved that those present should accord to him a hearty vote of thanks for his visit. This was carried with acclamation.

At the close of the meeting a pleasant hour was spent when both Districts of the Association joined together at tea.

The Western District will visit the Kirkintilloch Gas-Works on Nov. 21.

COMMERCIAL MOTOR TRANSPORT.

The past two years or so have witnessed a remarkable development in the manufacture of mechanically-propelled road vehicles for general commercial purposes; and it was the advance made since 1923 in the production of road vehicles for all industries and public service purposes that was put forward as justification for the organization, by the Society of Motor Manufacturers and Traders, of the Seventh International Commercial Motor Transport Exhibition which has lately been held in Olympia. Here were assembled a range of vehicles and accessories calculated to cover the requirements of practically every branch of the industrial and commercial community to whom economic transportation is an important factor.

Both in extent and in quality it was a striking display. Many an industrialist must have found an easy solution there to his problems of transport; but to the layman, perhaps the first sensation, in passing down almost any one of the numerous gangways, would have been a thrill of satisfaction at noting the luxurious lines on which the passenger vehicles exhibited were designed. These are actually going into service—for many of them had the names of their owners inscribed upon their sleek and beautifully-coloured sides, while yet others were marked "Sold." Those who are old enough to remember the horse omnibuses, with their "knifeboard" on top, and their doubtful methods of ventilation inside, are able to appreciate the incalculable benefits which this mechanical age has already bestowed upon travellers; but there is evidently much more still in store—not only for the privileged owner of the private car—but for those who desire or whom circumstance leads to tour in motor brakes and to go about their business in omnibuses. There is concentration on increase of space and on increase of comfort in the seats provided. This would seem to be leading to an increase in body size, which without doubt the improvements in engine construction render a matter of no consideration. The governing consideration must be availability of space on the roads.

VEHICLES FOR BUSINESS PURPOSES.

Improvement in every direction was also noticeable in this section. The colours here were not, of course, so varied or, generally speaking, so brilliant in hue as were to be seen among the passenger vehicles; but there was quite sufficient in this way to convince one that the growth of mechanical transport of goods will do more and more to counteract the dullness of urban thoroughfares, while giving an additional touch of brightness to the country roads. In short, with most types of motor vehicles, usefulness seems to lose nothing by being combined with prettiness; and therefore, wherever practicable, by all means have prettiness.

THE "SUPER-SENTINEL."

Here, again, it is impossible to enumerate; but a few words must be said about the stand of the Sentinel Wagon Works, Ltd., of Shrewsbury, if only because there was exhibited there a "Super-Sentinel" three-way tipper supplied to the order of the Gas Light and Coke Company.

The "Super-Sentinel," while following the main lines and retaining all the well-tried fundamental principles of the "Sentinel," differs from the latter in many important details; the most novel and noticeable point of the new vehicle being the design of the differential. In the old "Sentinel" this was of a conventional type, and was housed in the chain wheel on the back axle. The new "Super-Sentinel" differential is in the crankcase of the engine, and, moreover, is not only in the crankcase, but in the crankshaft itself. This patented feature has enabled the "Sentinel" designers to dispense entirely with lay-shafts, thus retaining all the old simplicity of the "Sentinel," and yet securing the great advantages of an unbreakable stationary back axle, a smaller and lighter differential which can be housed where no road dust can reach it, and reduced wear on tyres and road. Furthermore, the new design of differential has enabled the makers to incorporate in it a friction device whereby the differential itself is prevented from functioning until there is about 10 to 15 p.ct. difference in tractive effort at the rear road wheels. This last feature has resulted in a wagon which is practically immune from side slip.

The next most important innovation as regards the engine is the placing of the cam shafts inside the crankcase, and the use of two cam shafts (one for the steam valves and the other for the exhaust) in place of the former single cam shaft running underneath the cylinders. This arrangement not only allows of better steam distribution, and gives space for broader and better-shaped cams, but it also ensures the cam shafts receiving abundant lubrication from the oil-sump in the crankcase into which the cranks and balance weights dip. The valves of the new engine are all at one end of the cylinder, which arrangement facilitates ease of inspection and removal. They are made of stainless steel.

The boiler is a modification of the "Sentinel" boiler. It consists, as before, of an outer cylindrical shell and an inner cylindrical firebox; this latter being so arranged that it can be dropped clear of the shell by undoing only two joints, and without disturbing any external connections. The tubes, however, instead of being nearly horizontal as in the old "Sentinel" boiler, are steeply inclined, and arranged in three spiral banks. In order to accommodate the tube ends, the firebox is pressed with a series of spiral grooves in which the tubes can be expanded. By quicker circulation, scaling in the tubes is reduced; and this design has been found to give better steaming than even the old "Sentinel" boiler. What is still much more important, it keeps cleaner, since now there is no possibility of large pieces of coke, &c., lodging among the tubes, to the detriment of the boiler draught. Another great advantage is that the tubes themselves form a sort of natural stoking shoot; and there is now, therefore, only necessity for an upper-half guide, which does not project beyond the centre of the tubes or into the firebox proper, at all. This does away with any trouble of burnt stoking shoots. A large sized superheater is fitted in the usual "Sentinel" place; and the superheat has been raised from 100° to 150° Fahr.

The power is transmitted from the engine by two roller chains of finer pitch than the single chain they replace on the "Sentinel." This allows of sprockets and chain wheels with a larger number of teeth, which is conducive to greater silence and better wearing qualities. The two rear road wheels are bushed with long phosphor-bronze bushes, and are secured in place by a very simple locking device, which can be taken off in a few minutes, and cannot possibly come off when not wanted to do so. This is another advantage of the new design, as it allows the wheels to be removed in a few seconds when retyring is necessary. The patent front axle and steering gear have received considerable attention in the new "Super-Sentinel;" the whole gear being immersed in an oil bath. The engine is very carefully balanced, with the result that the "Super-Sentinel" is said to be quite as smooth running as the average motor omnibus.

The whole vehicle is being built strictly to jig and gauge on the interchangeable plan; and since every detail has been designed, from the start, with a view to its most economical production, it is possible for the Company to offer the new vehicle for sale, with all its advantages, without increasing the price. The entire design has been subjected to nearly five years' continuous testing before being offered to the public; and the features of the "Super-Sentinel" are covered by about twenty new patents.

Other features of the Exhibition will be dealt with next week.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Thanks to the Coke Competition Adjudicators.

SIR,—With regard to the Coke Competition, which was instigated by Sir Arthur Duckham with his usual far-sightedness and breadth of vision, I feel that I cannot let this event pass into history without saying, on my own behalf, and I am sure in this matter that I am also speaking for the industry, that we feel greatly indebted to those gentlemen who gave so much of their valuable time to the consideration of the papers in this most interesting competition.

Mr. A. F. Bezant, Editor of the "GAS JOURNAL," Mr. A. W. Smith, General Manager and Secretary of the Birmingham Corporation Gas Department, and Mr. W. B. Leech, Engineer of the Beckton Gas-Works, are all very busy men; and I am sure the industry is under a debt of gratitude to them for acting as adjudicators in this matter

I shall be glad if you will kindly publish this letter.

D. MILNE WATSON.

The Gas Light and Coke Company,
Horseferry Road,
Westminster, S.W. 1,
Nov. 6, 1925.

[On behalf of his colleagues on the Adjudicating Committee and himself, the Editor of the "JOURNAL" very sincerely thanks Mr. Milne Watson for his generous acknowledgment of the services they rendered in connection with the Coke Competition. The work absorbed much time; but it was highly interesting, and the cause was that of the gas industry, whose interests the three members of the Committee have deeply at heart.]

Tar v. Bitumen.

SIR,—I have been abroad for six weeks, and hasten on my return to thank "Safety First" for his letter in your issue of Sept. 23, and to assure him that for years past I have done my best in the direction suggested in his last paragraph.

I myself have had with gloves and patience to pick off my cars misplaced tarry bits of stone, and have even threatened to take them back to the works and sell the tar to the surveyor over again. I think, however, "Safety First" will agree that, considering the vastly increased use of tar, the nuisance is now commendably infrequent.

Concerning slipperiness, I have a faint recollection of having offered to make a bet with "Motorist" that a skiddy road was a bitumen, and not a tar, treated road; but as this was only one of my "cheap witticisms," it may well have missed the eye of "Safety First."

I also thank you, Sir, for your footnote to "Motorist's" letter in your issue of Sept. 30, but do not be too hard on him. I am sure he will be good now.

HERBERT W. ROBINSON.

Exchange Buildings, Birmingham,
Nov. 3, 1925.

Coke for Domestic Stoves.

SIR,—The letter from Mr. J. W. Scott respecting the burning of coke in anthracite stoves is interesting to me, as I am at present engaged in extending our sales of coke by attention to this prospective use.

One of our customers has used coke nuts (size 2 in. to ¾ in.) in an anthracite stove for over two years, and is thoroughly satisfied with the efficiency and economy he obtains from it. We are securing a number of orders and repeat orders for coke where anthracite has been previously employed; and I believe that in any form of closed stoves used for domestic purposes coke will be found to be entirely suitable.

JAS. TAYLOR.

Gas-Works, Weston-super-Mare,
Nov. 7, 1925.

Remembrance Day.

SIR,—At 11 o'clock this morning the thoughts of all men and women will be concentrated in silent homage for two minutes on the immortal million who gave their lives in the service of their country during the great war. When, two minutes later, the country resumes its normal course of daily business, no more fitting determination can be allowed to take root than the urgent necessity which imposes itself on each and all to do the utmost that lies in their power to mitigate the plight in which so many thousands of ex-Service men and their dependants are placed at the present moment. Of the millions who will join in to-day's act of silent reverence, the majority will probably have performed some part of that duty towards the necessitous by purchasing a Flanders Poppy; but there will be many thousands who can do more, and to these I desire most urgently to address an appeal for that extra to be done, and done promptly and liberally.

Lest it should be supposed that the benevolent activities of the British Legion are within measurable distance of coming automatically to an end, as we recede from the years of war, it cannot be too widely known that the Legion is constantly being called upon to institute new ameliorative agencies for coping with the problems born of the war. There are, for example, over 42,000 tubercular ex-Service men; there are more than 500,000 disabled men, including nearly 50,000 who are unemployed; there are 160,000 widows in receipt of pensions which are often inadequate; and there are some 300,000 orphans (including 18,000 who have lost both parents). Here are some typical sections of those who have suffered—and are still suffering—through the consequences of the war; and in their welfare the Legion, in accordance with the terms of its Royal Charter, takes an active interest.

To cite only one instance of what is being done, I would mention that for the past twelve months the Legion has been responsible in every sense for Preston Hall, near Maidstone—that great settlement for tubercular ex-Service men and their families. There is room for nearly 300 families at Preston Hall; and the maintenance of such an institution, conducted according to the latest developments of modern science, constitutes in itself a heavy financial responsibility.

There are many other lines along which the work of relief, &c., must proceed; but lack of funds prevents their full development. In every case it is work of such a nature as to make a compelling appeal to the practical sympathies of the public; and I feel confident that my request for immediate and generous support will find a ready response. Donations are the urgent need; and cheques, made payable to "Earl Haig's British Legion Appeal," and crossed "Barclay & Co.," should be addressed to No. 26, Eccleston Square, London, S.W. 1.

HAIG, F.M.

Nov. 11, 1925.

MISCELLANEOUS NEWS.

SOUTH SUBURBAN GAS COMPANY'S STANDARD PRICE.

Application for Revision.

On Tuesday of last week Mr. J. F. RONCA (Director of Gas Administration at the Board of Trade) postponed an inquiry into an application by the London County Council, under section 1 of the Gas Regulation Act, for a revision of the standard price of the South Suburban Gas Company. This course was adopted in order to give the Company themselves an opportunity of considering an application, either to the Board of Trade or to Parliament, for a revision.

Mr. W. E. TYLDESLEY JONES, K.C. (who, with Mr. JACQUES ABADY, represented the Company), said that the application was for a revision of the standard price which was fixed by the Board of Trade under the South Suburban Gas (Charges) Order of 1921. Under the proviso to section 1 of the Gas Regulation Act, the Board of Trade had power to revise the standard price to a degree corresponding to any alteration in costs and charges of, and incidental to, the production and supply of gas which might be proved to have taken place since the Order of 1921 was made. Two London Gas Companies had already had their standard prices revised; but in the case of the South Suburban Company certain special conditions arose. In 1914 and 1918 the Company had taken over certain undertakings on terms which it was considered were possible, in view of the economies it was anticipated would be effected, partly by the combination of those undertakings, and partly by the erection of new works in Belvedere which were authorized in 1914. Unfortunately, however, the war and post-war conditions had nullified the reasonable expectations of all parties. Therefore the view of the Company was that revision of the standard price in the manner proposed would do a very serious injury to the Company. He asked that the hearing of the present application should be adjourned for such a period as would enable the Company to consider an application to the Board of Trade under section 10 of the Gas Regulation Act, or, should that be impracticable, to Parliament, for a revision of their price. Such an application would enable the circumstances which he had indicated to be taken into account; and, if there were anything in them, they could be properly appraised. He suggested an adjournment until the middle or end of January next.

Mr. RONCA said he was inclined to think that the application for an adjournment was reasonable. He would, however, like to hear the views of the London County Council.

Mr. ROWAND HARKER (for the Council) said he was instructed—especially in view of Mr. Ronca's expression of opinion—not to object to the application for adjournment; it being clearly understood that, in not objecting, the Council did not in any way prejudice their opposition to any Order or Bill of the Company. The Council must have an entirely free hand to criticize, as they thought fit, in the public interest, any proposals which the Company might make in the future. He urged that if the Company decided to proceed by Bill they should take all steps available to them to obtain a decision of Parliament next year.

Mr. TYLDESLEY JONES agreed to this.

Dr. J. M. NEWNHAM (Town Clerk of Croydon) adopted, on behalf of his Corporation, what Mr. Harker had said on the same understanding.

Mr. TYLDESLEY JONES said the Company fully appreciated that, in assenting to the adjournment, neither the London County Council nor the Croydon Corporation were in any way tying their hands in regard to any criticisms they might make.

It was decided to adjourn the inquiry until Jan. 28, 1926.

GAS COMPANIES' PROTECTION ASSOCIATION.

Annual General Meeting.

The Twenty-Eighth Annual General Meeting of the Association was held last Thursday, in Caxton Hall, Caxton Street, Westminster, under the Chairmanship of Dr. CHARLES CARPENTER, C.B.E. The register of attendance showed that those present on the occasion included Messrs. R. W. Edwards (Aldershot), W. F. Whittaker (Grays and Tilbury), W. Phillips (Luton), D. H. Helps (Reading), F. J. Bradfield (Commercial Gas Company), R. Bruce Anderson (City of Waterford), George Anderson (Dover), J. L. Garrard (Eastbourne), and E. J. K. Fussell (Tottenham).

The ASSISTANT SECRETARY (Mr. R. G. Cooper), on behalf of the Secretary (Mr. F. E. Cooper), who was absent through indisposition, read the notice convening the meeting, and presented the minutes of the last meeting, which were duly confirmed.

ANNUAL REPORT.

The annual report of the Committee was as follows:

The Committee herewith present the revenue account and balance-sheet, together with a report of the proceedings for the year ended Sept. 30, 1925. The ascertained expenditure amounted to £530 0s. 4d. The revenue was: Subscriptions and donations, £488 15s. 6d.; interest on War Loan, £72 10s. —amounting together to £561 5s. 6d., and leaving a surplus for the year of £31 5s. 2d. From the balance-sheet it will be seen that the assets amount to £1871 15s. 10d., consisting of £1450 5 p.ct. War Loan, 1929-47, at cost, £1377 10s. (the value of which at the date of this report is £1484 8s. 9d.); balance at bank, £487 19s. 11d.; and cash in hand, £6 5s. 11d. Since Sept. 30 last the sum of £4 14s. 6d. has been received in respect of subscriptions in arrear. The amount outstanding, which is in respect of unpaid subscriptions for this year, is £9 9s.

The Statutory Gas Companies (Electricity Supply Powers) Bill, promoted under the auspices of the Association for the purpose of overcoming the difficulties standing in the way of statutory gas companies obtaining Special Orders from the Electricity Commissioners (which passed second reading in the House of Commons in the session of 1924, but was dropped owing to the dissolution of Parliament in the autumn of that year) was on Feb. 24 last again presented by Mr. Reginald Clarry. The Bill passed the Commons without opposition or amendment. At the second-reading stage of the Bill in the House of Lords its rejection was moved by Lord Banbury. The case for the Bill was ably put by Lord Raglan, whose ready help and interest, as sponsor of the measure in the Lords, the Committee gratefully acknowledge. After an interesting debate, the Bill was read a second time without a division. Some slight amendments were made in Committee of the Whole House—which, however, did not affect the utility of the Bill—and on July 31 it received the Royal Assent. Although the Bill is a short one, its preparation and promotion involved a considerable amount of work for Mr. Campbell Cooper (of the firm of Messrs. R. W. Cooper & Sons, the Parliamentary Agents to the Association). Many interviews and much correspondence were necessary with officials of the Board of Trade, the Ministry of Transport, and the Electricity Commissioners, before the form of the Bill was finally settled. The Committee feel that they were fortunate in having a Member so tactful and persevering as Mr. Clarry to pilot the Bill through Parliament during a busy session; and they take this opportunity of expressing their sincere thanks to him for his invaluable services in the matter.

The Board of Trade submitted to the Committee, for its observations, the forms applicable to the returns to be made by gas companies under the Census of Production (1925) Order, 1923. With the assistance of Mr. F. J. Bradfield, the General Manager of the Commercial Gas Company, the Committee gave the matter of the returns full and careful consideration. Interviews and correspondence between the Secretary and the Board of Trade took place, and as a result many useful suggestions as to the form and scope of the returns were adopted by the Statistical Department.

The Committee appointed six of its members to represent the Association at a conference of representatives of various public utility undertakings with regard to the question of laying mains and cables in public highways. Briefly, the object of the conference is to settle with representatives of highway authorities a common form of clause to be embodied in future Orders and Private Bills, authorizing undertakers to lay mains in or alongside public highways. The members of the Committee who were appointed were Messrs. R. W. Edwards, C. F. Botley, J. Ferguson Bell, D. H. Helps, and W. F. Whittaker. Mr. A. Stokes, of the South Metropolitan Gas Company, was a co-opted member. Mr. Edwards and the Secretary were appointed the Association's representatives on the Sub-Committee. The conference is still engaged in considering a draft clause as to breaking-up of highways, &c., prepared by representatives of local authorities.

The Committee have had under consideration the Rating and Valuation Bill, which was also considered by a standing Sub-Committee of the various public utility undertakings, upon which the Vice-Chairman represented this Association.

A matter which called for action by the Committee was the supply of electricity by local authorities outside their jurisdiction, and the proposed provision of funds by the late Government for such purposes. Letters embodying the views of the Association on the matter, signed by the Chairman, were forwarded to the present Prime Minister and the Chancellor of the Exchequer.

Another matter in which the Committee took action last Session was in connection with a Bill for electricity powers, promoted by the Horley District Gas Company. It would not have been necessary for that Company to promote a Bill at all for electricity purposes, if Mr. Clarry's Bill had then been law. After it was known that the Horley Gas Company intended promoting their Bill, a small local Electricity Company was formed, and promoted an Order for practically the same area as that covered by the Gas Company's Bill. The Bill and Order consequently became competing applications. It should be stated that, in the course of the proceedings, an attitude was adopted, both by the Electricity Commissioners and by the Minister of Transport, to the prejudice of the Gas Company and all other gas companies in a similar position, to which this Association took exception. The Committee felt, therefore, that it was their duty to assist the Horley Gas Company in the promotion of their Bill, and they rendered them substantial service in support of it. The Bill was passed by the Lords Committee, but was rejected by the Commons Committee. That did not necessarily end the matter, however, as the Order has yet to be approved by each House of Parliament; and it remains to be seen whether the House of Lords will ratify the decision of the Commons Committee or uphold the decision of their own Committee by refusing their approval of the Order.

The Vice-Chairman, Mr. G. W. Anderson, Mr. Ferguson Bell, and Mr. C. F. Botley represented the Association at a conference convened by the British Engineering Standards Association, with a view to introducing American standards throughout South America. A report of the proceedings was laid before the Committee, from which it appeared that no definite conclusion was reached.

The question of the expiration of the Public Utility Companies (Capital Issues) Act, 1920, received the attention of the Committee, and on their instructions the Secretary wrote to the Director of Gas Administration, expressing the hope that this useful Act, with its economical and speedy procedure, would be continued for a further period. In reply the Board of Trade intimated that they were not prepared to take legislative steps to keep the Act in force, and pointed out that the powers hitherto obtainable by gas companies under the Act could be secured by means of Special Orders under the Gas Regulation Act. As the cost of obtaining a Special Order is much heavier than that of obtaining a consent under the first-mentioned Act, the Committee regret that the Act has been allowed to expire.

It is with deep regret that the Committee have to record the loss of their distinguished colleague Mr. Henry E. Jones, whose death occurred suddenly at his residence at Ongar on March 24 last. From the commencement of the Association he took the warmest interest in its work and welfare, and on the retirement of Sir George Livesey, in 1903, succeeded him as Chairman, which office he held for seventeen years; and during this period he rendered invaluable assistance to the gas industry. The vacancy on the Committee occasioned by the death of Mr. H. E. Jones, has been filled by the appointment of Mr. F. J. Bradfield, the General Manager of the Commercial Gas Company.

Many members of the Association have, during the past year, availed themselves of the privilege attaching to their membership, of interviewing, and corresponding with, the Secretary on many legal, parliamentary, and technical matters, the varied nature of which may be gathered from the following summary: Damage to street lamp; income-tax (many letters); issue of debenture stock; stand-by supply; insurance of loss of profits in consequence of fire; abandoned supply pipe (section 2, Gas-Works Clauses Act, 1871); charging differential price for gas; reconstruction of roads—costs of altering gas apparatus; supply of electricity by local authorities outside their jurisdiction; charging cost of vertical retorts to renewal fund; damage to gas lamps not the property of a gas company; subscriptions to charitable institutions; charge for gas consumed in different area from where metered; corporation profits tax; correction of error in share certificate; establishing a benevolent fund; Widows, Orphans, and Old Age Contributory Pensions Bill; storage of gas on other than scheduled lands; alleged trespass in laying service pipes; costs of disconnecting lamps on cessation of public lighting; damage to roadway by escape of gas; increase of dividend in general meeting by amendment of Directors' proposal; course to be adopted in reference to dividends unclaimed for many years; redemption of redeemable preference stock.

The following members retire from the Committee, in accordance with Rule 12: Messrs. C. M. D. Belton, Ralph Halkett, William Phillips, George Stevenson, W. W. Townsend, and W. F. Whittaker, all of whom offer themselves for re-election.

THE LATE MR. H. E. JONES.

The CHAIRMAN said that, before proceeding to the business of the meeting, it was his sad duty to refer to the great loss which the Association had sustained by the death of Mr. Harry Jones. It would be recollected that, as far back as 1903, Mr. Jones took over the position which had previously been occupied by Sir George Livesey; and he retained it until 1920, when increasing years made it necessary for him to lighten in some measure his work. Mr. Jones was in every way a source of strength to the Association; for he was deeply interested in the supply of gas by companies, and knew all the important points that needed watching, and how very important it was that they should present a united front in dealing with the various difficulties, oppositions, and endeavours to limit the extent of the functions of gas undertakings. At this length of time after his death, he did not think he could ask those present to do more than rise in their places, as a token of respect to the memory of their departed friend, the loss of whom they one and all deplored.

This the members did.

THE FINANCIAL POSITION.

The CHAIRMAN then proceeded to discuss briefly the main points touched upon in the report—mentioning first that, among a number of letters expressing regret at inability to attend was one from Mr. J. Ferguson Bell, who expressed the hope that an endeavour would be made to persuade more companies to join the Association. Mr. Bell added: "For all companies the Association render in various ways good service in protecting their interests at exceedingly small cost; and having regard to the menace of municipal socialism, it is all the more important that we should do all we can to increase our membership." In moving that the report of the Committee and the accounts for the year ended Sept. 30 be received and adopted, he would like first of all to draw attention to the financial position of the Association, which he regarded as very satisfactory, because the surplus for the year of £31 5s. 2d. remained after allocation of somewhat abnormal expenses in connection with the support of the Horley District Gas Company's Bill, to which he would refer later. From this point of view, therefore, he thought they might congratulate themselves upon the progress they were making.

GAS COMPANIES' ELECTRICITY SUPPLY POWERS.

The report next dealt with the Statutory Gas Companies (Electricity Supply Powers) Bill, which was promoted under the auspices of the Association. Here the work accomplished was exceedingly good, and they were very much indebted to Mr. Reginald Clarry for what he did in the matter. The principal advantages of the Bill were, of course, only likely to be shared by the smaller undertakings; but the measure might possibly also be found useful in the case of some of the larger ones who had electricity provisions in their Acts, and might find this a better way of utilizing them than the ordinary machinery.

CENSUS OF PRODUCTION.

It was rather difficult to imagine how some of the questions in the returns to be made by gas companies under the Census of Production (1925) Order, 1923, came to be framed in the first instance. Cer-

tainly they did not appear to have originated with any gas undertakings or with anyone having close association with them. However, when the forms applicable to the returns were submitted to the Association by the Board of Trade for their observations, the Committee took the matter up, and obtained the assistance of Mr. F. J. Bradfield (the General Manager of the Commercial Gas Company), who was thoroughly acquainted with all these matters. Mr. Bradfield was very cordially received by the Board of Trade; and he was able to point out how to make the inquiry a really intelligible and useful one to all concerned, instead of the comparatively useless one that it would otherwise have remained. A good deal of correspondence took place, and one or two interviews; and the result was that practically all of the suggestions put forward had been adopted, and would form the basis of the returns which would be used in future by the Statistical Department.

LAYING MAINS IN PUBLIC HIGHWAYS.

A question which had always been difficult, and which seemed to be becoming increasingly so, was that with regard to the laying of mains in the public highways. In addition to what had been stated in the report, the fact did remain that local authorities were from time to time pressing for various concessions; and the trouble was the usual one, that they might give here and there to overcome a difficulty, but this was apt to form a precedent which it was not always easy to get over on subsequent occasions. It would be very desirable if they could agree upon some form of clause that would be acceptable to the gas industry at the same time that it met with the approval of the local authorities. Every effort should be made to arrive at some sort of agreement, which could be embodied in a standard clause, so as to save the worry and expense of continuously dealing with the proposals that cropped up in this connection; and the Committee had appointed a very good Sub-Committee to be the representatives of the Association in this matter. This Sub-Committee had not yet completed their labours.

HORLEY GAS COMPANY'S BILL.

Most of those present would remember something of the Bill promoted by the Horley District Gas Company to secure electricity supply powers, and would have realized that, as pointed out in the report, had Mr. Clarry's Bill been law then, it would not have been necessary for the Horley Company to promote their Bill at all. The Committee of the Association secured a good deal of opinion on this matter, and decided after full consideration upon the course they had adopted. The whole thing was not yet finally settled, and nothing definite would be known until the House of Lords met again. Mr. Cooper was hopeful of a favourable result; but this was all that could be said on the point at the moment. What might be emphasized perhaps was the general attitude of the Electricity Commissioners on the question, as revealed during the proceedings on the Bill before the Parliamentary Committee. The general view of the Commissioners on the subject was this:

> That they think there may be the cases where it is right and proper that the supply of electricity may be entrusted to a gas company, because in some cases it may be the only means by which a district can get a supply of electricity. The prospects may be so poor that no body or company, except the gas company, may be able to deal with the situation. Therefore, the Commissioners would not consider that a proposal to entrust electricity powers to a gas company should be opposed on principle; but they recognize what must be perfectly obvious to everybody, that on general grounds it is preferable that the supply of electricity should, where a company or body of people are able and willing to undertake it, be in the hands of the body whose primary and sole duty should be the supply of electricity. And in saying that, it must not be supposed that in every case the Commissioners would think that the supply should be entrusted to the electricity company, because there may be cases where a gas company could show such an overwhelming advantage from their being given additional powers that they would even outweigh a scheme put forward by an electricity company.

This was the view of the Electricity Commissioners; but in arriving at it, there must have been, it seemed to him, one or two points which were not so clearly in their minds as they were in those of gas company administrators. In the matter of the amount they might pay in dividends, electricity companies were more or less unlimited, which was not quite the same condition of affairs as prevailed with gas companies. Another important point was that gas companies' capital was raised under the auction clauses; and he should imagine that, as a whole, money might be obtained more cheaply in the case of gas undertakings than it would be under conditions which pertained to electricity supply. Of course, they could not go back upon the past; but history would have been written very differently had it been possible for those who were responsible for dealing with the matter in the earlier years to look into the future, because it must be obvious to all that the present system could not be an economical one. A method by which they had two sets of people supplying two forms of energy in the one area, with their separate machinery, could hardly be so economical an arrangement as one by which the two supplies would be in the same hands, and the duplication of many charges would be prevented. Though fuel might not be the biggest item in the case of electricity supply, it was an important one; and seeing the advances that had been made with the recovery of waste heat in gas-works, it would not be inappropriate to pass some of it on for the generation of electricity. There were, in fact, fundamental reasons why, in circumstances where it was possible, they should have joint control—not only in the interests of the gas undertaking or of the electricity undertaking, but in the interests of the public generally.

A QUESTION OF PRINCIPLE.

The Committee were particularly anxious that he should give evidence before the Coal Commission on this point, and it had been arranged that he should do so within the next few days. There was another matter which needed watching very carefully—a question of principle involved in electricity supply. What happened nowadays with regard to municipal electricity supply was that the suppliers were able to operate outside the area which, for local government purposes, was allocated to them. One could have an electrical undertaking in "A" supplying current to "B." This might be economical or uneconomical; but Parliament did not appear to have interfered with municipal undertakings supplying electricity outside their own area. There did not seem to be any protection for the ratepayers in that area, if the local authority chose to undertake this added responsibility; nor did he think that in this case the Electricity Commissioners exercised any sort of control. They were mainly concerned with the increased supply of current; and he did not know that it mattered to them if "A" chose to drop money in supplying "B." The net result was, as he had remarked, that the large ratepayers had very little to say in a matter which might concern them greatly. Sooner or later some serious endeavour should be made to enable gas companies and other large ratepayers to have some say in what was done by the various borough councils. At present they had none. They could support the Ratepayers' Association, but beyond this they could not go.

STANDARDIZATION.

Mention was made in the report of the British Engineering Standards Association, who had done a great deal of good work, particularly for those who were engaged in steel and iron constructional work and shipbuilding. The gas industry, he thought, as an industry, had never done very much in the way of standardization; and perhaps it might do more. A few days ago he had seen a ball-and-socket joint which had been imported into this country, and could not quite understand it. A body of men familiar with the mechanical details of such a joint should be able to decide upon a standard ball-and-socket joint.

PUBLIC UTILITY COMPANIES (CAPITAL ISSUES) ACT.

The report also made allusion to the expiration of the Public Utility Companies (Capital Issues) Act, 1920. In reply to an inquiry addressed to the Director of Gas Administration by the Secretary, the Board of Trade had stated that they were not prepared to do anything to keep the Act in force. Really, he did not know that they could quite expect them to take any other attitude; but it was thought desirable that they should put their representations before the Board.

THE ASSOCIATION.

The Association, as they all knew, was something more than one which provided an annual meeting and did a certain amount of work before the Parliamentary Committees. For the 28 years during which the Association had been in existence it had had the advantage of the knowledge that Mr. Cooper had acquired in gas matters, and which he was ever ready to impart to inquirers—a privilege that was of great value, particularly to the smaller undertakings. The report, as usual, gave an indication of the various matters upon which the Secretary had been consulted during the past year. This would give them some idea of the work performed for the members. These, he thought, were the only matters he had to deal with on the report.

SECTION 1 OF THE GAS REGULATION ACT.

The VICE-CHAIRMAN (Mr. R. W. Edwards, of Aldershot), in seconding the adoption of the report and accounts, said the ground had been so well covered by the Chairman that very little was left for him to say. He would, however, like to pay tribute to the work which had been undertaken in connection with Mr. Clarry's Bill. The Act would, he was sure, be of extreme value to gas undertakings, whether or not they already possessed electricity powers. Its effect would be more fully appreciated as time went on, because there was no doubt that electricity was going to be developed in very small areas. This Act would permit the gas undertakings in those small areas, instead of being overrun by some outsiders, to apply for powers to take electricity in bulk or put down their own plant if a bulk supply was not available, and thereby operate both undertakings efficiently and, he believed, economically. With regard to highway authorities, the Chairman had said rightly that it was in the interest of the gas industry that there should be some standard clause agreed with the municipal bodies—and particularly the county councils. In conjunction with other road users—electricity, water, tramways, and light railways—they had been employed in trying to arrive at some agreement; but up to the present moment they had not quite seen eye to eye with the other side. He did, however, want it to be clearly understood that the gas industry felt perfectly satisfied with the law as it stood to-day. The Rating and Valuation Bill, which was coming before the House, had been modified, largely owing to the representations of the public utility undertakings, on the understanding that the portion which was deleted would come forward later, when their representations, which were of great value, were to be taken into consideration. As to the Capital Issues Act, while, of course, the Board of Trade intimated that they were not prepared to take legislative steps to keep the Act alive, they put themselves out of the way to help those gas companies who found themselves in a predicament, by facilitating the obtaining of Special Orders. In the case of one of his own companies, he was greatly indebted to the Board of Trade for their courtesy in this respect. They had been enabled in this way to retain the additional borrowing powers sanctioned under the Capital Issues Act. This was another proof of the desire of the Board of Trade to assist the gas industry. Gas companies generally must feel that they were once more indebted to the South Metropolitan Gas Company, and their President in particular, for the excellent lead given to others by their policy. It was now, be thought, realized that section 1 of the Gas Regulation Act had not quite come up to anticipations. There were two weaknesses in it. One was the method of calculation, and the other was the exposure to annual revision. In 1920, the South Metropolitan Gas Company obtained an Act giving them a basic price; and they not

only established this new principle in the gas industry, but they got something which the Gas Regulation Act did not provide—namely, stability for five years. The five years having elapsed, the Company again faced Parliament, and fought their way through both Houses in a splendid manner, obtaining confirmation of their 1920 basic price, and stabilization for a further ten years. One could not say too much in praise of what had been done by Dr. Carpenter and his Company, in showing them what they wanted and must strive for. It was no use their endeavouring, as gas administrators, to raise sliding-scale ordinary capital under the present section 1. It would have to be amended, or they would have to find some other way of stabilizing their capital. He did think that in this matter they should express their gratitude to the South Metropolitan Gas Company and Dr. Carpenter for the good work they had done and the excellent lead they had given in this respect. ["Hear, hear."]

There being no discussion, the resolution was carried unanimously.

THANKS TO MR. REGINALD CLARRY.

The CHAIRMAN proposed a special vote of thanks to Mr. Reginald Clarry for his services to the Association and the gas industry generally. They had in an appropriate paragraph of the report dealt quite properly with the matter. They said: "The Committee feel that they were fortunate in having a Member so tactful and persevering as Mr. Clarry to pilot the Bill through Parliament during a busy session; and they take this opportunity of expressing their sincere thanks to him for his valuable services in the matter." They did owe a very great deal indeed to the admirable manner in which Mr. Clarry had acted. He had shown himself to be the worthy son of a worthy father in devotion to gas; and they looked forward to his help in the future in the same way as they had been dependent upon him in this particular matter. He had pleasure in proposing: "That a hearty vote of thanks be given to Mr. Reginald G. Clarry, M.P., for his great services to the Association and the gas industry generally in connection with the passing of the Statutory Gas Companies (Electricity Supply Powers) Act, 1925."

The VICE-CHAIRMAN seconded the motion, remarking that the vote was specially due to Mr. Clarry in view of the fact that he had had to go through his work a second time. The first time, the Bill disappeared in the General Election. He felt very pleased that it should have been a late member of the gas industry who had taken on the task, and thus rendered such signal service. He was also glad that it should have been the son of a late member of their Committee, and a gentleman who was held in such high esteem.

The resolution was cordially agreed to by the meeting.

RE-ELECTIONS.

The CHAIRMAN, proposing the re-election of the President (Sir J. Fortescue Flannery, Bart.), Vice-Presidents (Mr. Charles Hunt and Mr. Reginald G. Clarry, M.P.), and the retiring members of the Committee (named in the report), said he was glad that they all—in one case with a little pressure—offered themselves for re-election. Every one was useful to the Association.

Mr. DOUGLAS H. HELPS (Reading) seconded the proposition, which was agreed to.

The Hon. Auditor (Mr. W. A. Scottt, F.C.A.) was re-appointed, on the motion of the CHAIRMAN, who pointed out that Mr. Scott had a close connection with gas undertakings, and from time to time came forward with some very useful suggestions.

VOTES OF THANKS.

The CHAIRMAN, proposing a vote of thanks to the Secretary, said they would all be sorry to hear that—for the first time, he believed, in 28 years—he was unable to be present owing to indisposition. His absence was a source of great regret to all; and it would be the unanimous wish of the members that he might very soon be completely restored to health, so as to serve the Association for a long time in the future as faithfully as he had done in the past.

The vote having been cordially passed,

The VICE-CHAIRMAN proposed a vote of thanks to the Chairman, which was also heartily agreed to.

The CHAIRMAN, in the course of his acknowledgment, said he had thought for a long time past that there was no justification for the unstable condition of things which the history of the last fifty years had provided as the basis of the operations of gas undertakings today. So far as was compatible with having allotted to them a particular area of supply, a gas company should be in the same position as any other industrial organization. They should be freed from fetters absolutely out of date, and able to carry on as a business proposition in the best sense of the word. In fighting for this, his Company had met with persistent, and in some respects disappointing, opposition, because they had hoped that the enlightenment one heard of, and the increased cordiality of public bodies towards gas undertakings, would have resulted in their possessing more knowledge of the real facts than appeared to be the case when the Company came to close quarters with them. What the Company had accomplished would be very helpful to them and, he thought, to the industry generally. It was exceedingly gratifying to have got such an expression of opinion as had been voiced by the Committee. They could not, of course, bind a Committee ten years ahead, but they did say, in effect: "Come, not necessarily to have anything altered, but to say how you are getting on." He felt in his mind that the principle for which the Company had contended was now too firmly established to be upset. It ensured that, whatever might be the circumstances, the Company would be entitled to a reasonable return on the capital. There should be no objection to this, for gas companies did not pay large dividends, and it was only right that there should be security for capital. But in addition to this there should be an incentive to a company to do their best, and the incentive held out by their Act was that, in certain circumstances, they might divide a small proportion of the additional profits accruing between themselves and their employees. He regarded this as a very satisfactory basis upon which to work.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following notices regarding applications to the Board of Trade under the Act.

AMENDING ORDER.

Hampton Court Gas Company.

The Middlesex County Council have made application to the Board of Trade under sub-section (3) of section 1 of the Act for an Amending Order revising the powers of charging authorized by the Hampton Court Gas (Charges) Order, 1921, by reducing the standard price prescribed by that Order.

SPECIAL ORDERS.

Birkenhead Corporation.

To extend the limits within which the Corporation are authorized to supply gas; to make provision as to the price which may be charged for gas in the extended limits; and for other purposes.

Carlisle Corporation.

To authorize the Corporation to provide storage accommodation for gas upon land adjoining the Lamplugh Works, Rome Street.

Clitheroe Corporation.

To extend the limits within which the Corporation are authorized to supply gas; to empower them to purchase the business of the Bold Venture Lime Company, Ltd., as manufacturers and suppliers of gas in Chatburn and Downham; to enable the Corporation to purchase additional lands, to charge for gas on the thermal basis, and to borrow more money; and for other purposes.

Darlington Corporation.

To authorize the Corporation to borrow further money in connection with the gas undertaking, and to make further provision regarding the supply of gas.

AN ELECTRICITY DEPARTMENT AND GAS ADVERTISEMENTS.

An advertisement of the Newport (Mon.) Gas Company appeared in the "South Wales Argus" last Wednesday, stating that the Advertising Agent of the Newport Corporation had informed them that, acting under instructions received from the Corporation Electricity Department, the Gas Company's advertisements of their Centenary Gas Exhibition were not to be continued in the Newport tramcars. Inquiries having reached the Editor of the "Argus" as to the reasons which prompted this action of the Electricity Department, a representative of the paper sought an interview with Councillor F. W. Raikes (Chairman of the Electricity and Tramways Committee).

Mr. Raikes said that about a year ago the Newport Electricity and Tramways Committee passed a resolution that in future no advertisements of the Gas Company should appear in the tramcars. They were apparently of the opinion that, as gas was a competitor with electricity, and the electricity works were the property of the Corporation, it was not right that an advertisement of a rival concern should appear in the tramcars, which were also the property of the ratepayers. Presumably this minute was not communicated to the Advertising Agent, and so the advertisements appeared in the tramcars. Mr. N. J. Young (General Manager of the Electricity and Tramways Undertakings) had his attention drawn to the fact that this resolution had been passed, and therefore had no option but to ask the Advertising Agent to withdraw the advertisements, which was done. As the resolution had been passed, the Committee were bound to adhere to it; but they could, of course, rescind it.

GAS COMPANY'S VIEWS.

The action thus taken has been commented upon, in a letter to the "Argus," by Mr. J. H. Canning (the Engineer and Manager) on behalf of the Newport (Mon.) Gas Company, in the following terms:

My Directors feel that the recent action taken by a certain department of the Newport Corporation in refusing to display the advertisements of the Newport (Mon.) Gas Company's Centenary Exhibition in the public tramcars is so contrary to the spirit of liberty and fair play which have characterized British institutions, that they wish, in the public interest, to make the following observations thereon:

(1) The tramcars are not the property of the Electricity Department, but of the ratepapers of Newport, on whose behalf they are administered by the Newport Corporation. My Company are among the largest ratepayers, their contribution to the rates last year being nearly £4000; and they feel that they have an equal right with other ratepayers to the use of the advertising services of the Corporation.

(2) The Corporation tramways are a public transport service; and my Company do not compete with them in any way whatsoever.

(3) My Company are large users of the tramway service, and spent over the past twelve months some £200 for journeys made by employees and members of the staff.

(4) As ratepayers, my Company are of opinion that, in the interests of cheapness and efficiency, no legitimate source of revenue from advertising should be neglected by those responsible for the tramway service.

(5) In the neighbouring city of Cardiff, as in nearly all the large towns of this country, gas is advertised equally with electricity in the public tramcars and other vehicles.

In conclusion, I may say that my Directors feel that the Corporation of Newport as a body are in no way responsible for the somewhat narrow and partial point of view which appears to have been taken by one of their departments.

JUBILEE OF THE BIRMINGHAM GAS DEPARTMENT.

Bust of Joseph Chamberlain to be Unveiled.

The present year marks the jubilee of the Birmingham Gas Department as a municipal undertaking; the Birmingham Corporation Gas Bill having passed Parliament on July 18, 1875, and the transfer of control from the two companies then supplying the district to the Corporation having dated from Sept. 1 of that year.

The name of the late Mr. Joseph Chamberlain is inseparably associated with the foundation of the Gas Department, for it was mainly due to his efforts that the municipal authorities of fifty years ago were persuaded to undertake what appeared to the majority of them to be a "gigantic experiment." Mr. Chamberlain was Mayor of the town at the time of the purchase of the two gas companies then supplying the district, and on the formation of the first Gas Committee in 1875 he was unanimously elected Chairman, a position which he held until 1879. It may be safely said that the prosperity of the undertaking to-day is largely due to the sound foundations then laid down, and to the foresight which he showed.

It is particularly appropriate that the Birmingham Gas Committee should have decided at this time to have a bust of Mr. Joseph Chamberlain in the vestibule of the Department. The plaster cast, which is a fine piece of work, has been specially executed for the Committee by Mr. Courtenay Pollack, and will be unveiled in the course of a few weeks. It will occupy a position in the entrance hall of the Department, and will be a companion figure to that of William Murdoch, whose bust was placed in the hall about twelve months ago. It is a curious fact that, since Mr. Chamberlain vacated the chair, the position has been filled by men who gained prominence in many spheres of municipal life—the late Alderman Pollack, the late Alderman William Kenrick, and Alderman Sir Hallewell Rogers. Alderman John Henry Lloyd, who held the chairmanship from 1898 to 1900, and again since 1919, is well known as one of Birmingham's most public-spirited citizens.

EARLY DAYS OF THE UNDERTAKING.

Since the taking over by the Corporation of the two companies, the history of the undertaking has been one of continued progress, and to-day Birmingham possesses the largest municipal gas concern in the country.

The Department was fortunate in its first two Engineers—the late Mr. Henry Hack and Mr. Charles Hunt. They gave to the Birmingham works a reputation which has been upheld by their successors. The past few years have seen great improvements in the methods of manufacture and distribution, and the plant now installed at the five works of the Department is most modern in character.

Just before their purchase in 1875, the combined output of gas of the two companies amounted to approximately 1800 million c.ft. per annum. The Department now practically supplies this quantity in one winter month, and in the year ended March last the total was well over 13,000 million c.ft. The increase in the quantity of gas issued during the twelve months ended March 31 was 6·02 p.ct., and in the last six months 6·10 p.ct. The undertaking has individual consumers who take a quantity of gas in twelve months equal to the whole consumption of towns like Cannock or Hereford.

GROWTH OF GAS CONSUMPTION.

The growth in the consumption of gas per mile of main has been enormous. In 1875 the figure was 4½ milion c.ft.; to-day it approximates 13 millions. The tonnage of coal carbonized in the year ended March last exceeded 800,000, whereas fifty years ago it was not 300,000. The consumption of gas oil for the manufacture of carburetted water gas in some years approaches a figure of 5,000,000 gallons. Over 1000 miles of main have been laid, whereas the figure when the Department was acquired was only 400 miles. The turnover of the undertaking to-day is in the neighbourhood of £2,500,000 per annum, and, compared with this, the amount of business done in 1875 did not exceed £500,000. The capital value of the undertaking when it was taken over was £2,000,931; to-day the amount outstanding is £1,968,293, and the Department is at least six times the size. The number of employees is about 3400, and the annual wages bill amounts to approximately £450,000.

CONTRIBUTIONS TO RELIEF OF RATES.

During its fifty years of trading the undertaking has contributed over £1,600,000 towards the relief of the Birmingham rates. The production of residuals has grown enormously, and in addition to many other kinds of products some 400,000 tons of coke, 10,000,000 gallons of tar, and 36,000,000 gallons of ammoniacal liquor are disposed of per annum. Gas-lamps were only erected in the principal thoroughfares of the town fifty years ago. To-day there is practically no adopted road without lamps, and there are some 26,500 street lamps supplied with gas in the city and district. With the high-pressure lighting system in the centre of the city, Victoria Square is considered by authorities to be one of the finest lighted centres in the country.

Installed in the Department's area of supply are well over 200,000 gas cookers, 108,000 of which have been fixed in connection with prepayment supplies in artisans' dwellings. Birmingham was one of the first undertakings to popularize the prepayment meter; and the average consumption of gas through these amounts to 26,000 c.ft. per consumer per annum; the total amount through them during the year ended March last representing 25·41 p.ct. of the total gas used. About 90,000 gas fires and hot water appliances are installed in the city and its immediate neighbourhood, and orders for gas apparatus are at present being received by the Department at the rate of about 700 per week.

One of the more recent innovations of the Department is the industrial research laboratory, which has proved of great assistance to manufacturers. During the half-year ended September last, the industrial load represented 32 p.ct. of the total amount of gas sold. The quantity of gas used during the last ten years for industrial heating in Birmingham has increased by approximately 1400 million c.ft. per annum.

NEWPORT GAS COMPANY'S CENTENARY.

Exhibition of Progress.

To celebrate the centenary of the Newport (Mon.) Gas Company, an exhibition has been arranged at the Corn Exchange, Newport. This was opened on Tuesday, Nov. 3, and will be continued until Nov. 17.

The progress of the Company during the last half-century is shown by the fact that in 1875 the make of gas was only 84¾ million c.ft., while in 1924 it was 563 millions. The original works of the Company were at Maddox's Close, the site of a portion of the present Mill Street Works. In 1843 the Company was incorporated by Act of Parliament, but to cope with further increases they were obliged to go to Parliament again in 1855. Twenty years later the old site at Mill Street was no longer adequate, and in 1875 the Company secured Parliamentary powers for the Crindau site. The new Crindau works, designed by the late Alderman Thomas Canning, were opened in 1885; and as they were gradually expanded steps were taken to concentrate the manufacture of gas there, and the Mill Street Works, as a manufacturing station, were closed in 1909.

THE EXHIBITION.

The exhibition is a most interesting and valuable one, and includes stalls containing the latest and most economical designs in cookers, heaters, fires, domestic appliances, &c., suitable for either large establishments or small homes. One stall which is attracting great attention is that devoted to the exhibit of bye-products from the carbonization of coal, including coke, tar oils, drugs, disinfectants, perfumes, explosives, &c. Others are devoted to the exhibition of new and old types of gas apparatus, and to ammonium sulphate as a fertilizer. A special exhibit is being made of "Vitreosil." Every day demonstrations of pastry making and baking of sweets, cakes, &c., are given by Miss Perkyn, who was demonstrator at the Gas Exhibit at Wembley.

OPENING CEREMONY.

Mr. GEORGE GEEN, Chairman of Directors, presided at the opening ceremony, and there were also present Sir Garrod Thomas, D.L., Mr. C. F. Williams, Colonel J. C. Rennie Brewer, Mr. T. Spittle, Directors; Mr. J. H. Canning, O.B.E., the Engineer; and Mr. William Stanford, Secretary.

Mr. GEEN, declaring the exhibition open, said that when Newport was first lighted with gas, the population of the town was less than 4000, and neither railways nor docks existed. The total revenue of the Company in 1830 would be just sufficient to pay the present weekly wages bill. For 70 years gas provided the only lighting service in Newport. There were now 15,535 gas cookers in use in the district.

Sir GARROD THOMAS proposed a vote of thanks to Mr. Geen, who, in responding, paid a tribute to the work of Mr. J. H. Canning.

JAMES KEITH & BLACKMAN COMPANY, LTD.

Staff Dinner to Directors and Management.

Another important event in the history of the James Keith & Blackman Company—and one which again demonstrates the cordial relations existing between employees and management (it may be pointed out that in 1921 the London works employees entertained the Directors and management to dinner)—took place on the 30th ult., when the Directors and management were entertained by the staff of the head office and London works of the Company to a dinner in the Connaught Rooms, Great Queen Street. Hosts and guests numbered 110, and at the special request of the former the chair was taken by Mr. T. W. Alsop (Chairman of the Company), who was supported by Mr. T. B. Callard, C.C. (Director), Mr. C. Tuson (Director), Mr. George Keith (Managing-Director), Mr. J. W. Hampsheir (Director and Manager), Mr. W. B. Richards (Assistant Manager), and Mr. M. Burningham (Secretary).

The CHAIRMAN, calling upon the proposer of the toast of the evening, said that, though he was not expected to make a speech on this occasion, he could not miss the opportunity of emphasizing to the staff the necessity for continued effort on the part of all.

Mr. A. J. WHYTE (Chief of the Gas Department) proposed the toast of "The James Keith & Blackman Company, Ltd.," and opened his remarks by congratulating the new management, as represented by Messrs. Hampsheir, Richards, and Burningham. He thought it was also a matter for congratulation that the Company were able to hold their own in these difficult times. He attributed this to the facts that the name of the firm stood high, its status and reputation were good, and its products of first-class quality.

Mr. GEORGE KEITH, responding, referred to the fact that it was 25 years since the Blackman Ventilating Company changed their name to the James Keith & Blackman Company, owing to the amalgamation with the business of his father, the late Mr. James Keith.

The toast of "The Management" was proposed by Mr. J. C. R. WATSON (Chief of the Manchester office); and Mr. HAMPSHEIR, in the course of his reply, said that during the short time he had occupied the managerial chair he had discovered that a splendid spirit of enthusiasm animated the staff in their efforts to promote the prosperity of the Company.

Mr. CALLARD proposed "The Works and Branches;" the response being by Mr. A. G. VENIMORE (Chief of the Birmingham office) and Mr. W. B. DAVIDSON (Manager of the Company's Arbroath works and foundries).

British Industries Fair.—Over 50,000 invitations from the Department of Overseas Trade for the forthcoming British Industries Fair at the White City, London, and Castle Bromwich, Birmingham, are being issued to buyers in all parts of the world. This is, of course, apart from the very large number of invitations which will be addressed to home buyers.

ROYAL COAL COMMISSION.

The Case of the Gas Industry.

Evidence concerning the gas industry was given last week before the Royal Commission inquiring into the position of the coal industry. On Tuesday Dr. R. Lessing gave evidence of a general character as regards coal; while on Wednesday Mr. Milne Watson appeared before the Commission on behalf of the National Gas Council. Dr. Lessing's evidence occupied the whole of Tuesday, and Mr. Milne Watson's the greater part of Wednesday.

DR. R. LESSING.

Dr. Lessing said that, to counter a tendency towards a reduced coal consumption generally, and to allow British coal to compete directly and indirectly in the world's markets, two conditions must be fulfilled: (1) Coal must be produced more cheaply; and (2) its value must be enhanced by refining processes. The enhancement of value, however, seemed to him to be the most useful direction in which to hope for a rejuvenation of the coal industry. Two main avenues were open for raising the intrinsic value of raw coal—(*a*) a better preparation of coal itself for the market, and (*b*) the conversion of coal into, or the extraction from it of, the more highly priced materials.

Dealing with the preparation of coal for the market, Dr. Lessing said that at present the vast proportion, if not the bulk, of coal raised is subjected to practically no preparation, or an exceedingly casual or superficial one. In addition to suitable preparation on the surface—such as screening followed by the removal of shale and other dirt—he was of opinion that processes can be devised by which coal now "got" but rejected underground can be commercially and profitably recovered, with the threefold advantage of increasing the output per man shift, conserving our coal resources, and making the mines safer, because the coal substance left in a "goaf" in association with the loose dirt is liable to spontaneous combustion and gob fires.

A Promising Line of Development.

The most promising line of development in the preparation of coal for the market lies in the extended application of methods for the reduction or practical removal of ash; but two requirements must be fulfilled if the value of the coal raised is to be enhanced. First, a much larger tonnage of raw coal must be passed through the washing plants; and, secondly, the efficiency of the washing process must be considerably increased. From experiments which he has in hand now, he is confident that a great proportion of the coal as mined, and even of the low-grade portions, can be refined to qualities of much higher intrinsic value than those obtainable to-day. As showing the importance of this, he said that, assuming a total production in Great Britain of 250 million tons, 25 million tons of incombustible material are obtained, and the carriage of this costs approximately £4,500,000 per annum, while probably double this amount is spent on the collection and disposal of the ashes. The country's non-productive expenditure on this score could therefore safely be put at from £10,000,000 to £20,000,000—a waste which should surely be worth the closest scientific, technical, and economic examination. There are probably 80 million tons of slack produced in Great Britain per annum; but it should be possible to refine this slack so as to yield from 55 to 60 million tons of a material worth at least 20s. a ton, against 10s. a ton for the slack originally. The cost of refining should not be more than 2s. per ton, and there would be a clear profit of £14,000,000 per annum. This, of course, is a goal to be aimed at rather than a contingency likely to arise in the near future. Moreover, coal washing systems should be improved, yielding coals containing no more than 2 or 3 p.ct. of ash, or even less. For such fuels the consumer could afford to pay prices out of all proportion to the standards ruling to-day.

A highly desirable object of the preparation of coal, but one which is still an unsolved problem, is the separation into portions of different character. In this way, the actual ash in the coal could be almost completely removed, leaving only a very small percentage of combined ash in the actual coal substance—not more than 2 p.ct.

Carbonization.

Dealing with high-temperature carbonization, Dr. Lessing said the gas-making and coking processes are identical in principle, but differ somewhat in their aims. The principal object of the gas industry is the supply of gaseous energy. Hence care is taken to obtain a maximum yield of combustible gas of the right quality; and a portion of the coke made (65 to 70 p.ct. of the coal carbonized) is used as fuel for heating of the retorts. The coking industry is out to supply coke for blast furnaces and other metallurgical operations, and therefore puts all the coke made (total yield in gas making) on the market, and uses the gas as a fuel for the ovens. Modern types of ovens produce a surplus of gas over and above the oven requirements, and in many cases dispose of it in bulk to gas undertakings. Little attention has been paid hitherto by the gas industry as a whole to the quality of their coke. Coke ovens, on the other hand, of necessity are so constructed and operated that they yield a material suitable for blast furnaces and similar work. The gas from carbonizing operations contains a certain amount of benzole and similar hydrocarbons which on coke works is extracted, refined, and sold as motor spirit. The gas industry, rightly or wrongly, prefers to sell these hydrocarbons in their vaporous form along with the gas, and not in liquid form.

Coming to low-temperature carbonization, Dr. Lessing said the technical difficulties of the system are: Lower heating efficiency on account of a less steep heat transmission gradient, and smaller thermal conductivity, hence slower rate of carbonizing and larger ground space required; lower density of semi-coke, which is very bulky; and, in the case of certain coals, caking together of unwieldy masses which impede the ready discharge from the retorts. None of these difficulties is such as could not be surmounted by the skill of competent engineers and technologists. The reason why so many attempts in this field have ended in failure seems to be first and foremost ignorance on the part of many designers of the properties and behaviour of the material to be treated—viz., coal. A great many plants differing from each other in principle or in the details of design and operation have been experimented with during recent years, and several of them have been brought very close to a technical solution of the problem. Complete technical success is certainly in sight, provided inventors and contractors will acknowledge the limitations of individual plants as regards the character and quality of coal they are capable of dealing with.

The economic problem is, perhaps, more complex. Low-temperature carbonization of coal as an oil-producing proposition only cannot succeed. It may be remunerative in the case of oil shales and cannels with a very high oil yield, but with ordinary bituminous coal it must be borne in mind that about 70 p.ct. or more of the weight of raw coal is obtained as semi-coke. This 70 p.ct. must, therefore, find an assured market before the 7 or 8 p.ct. of liquid fuel obtained can enter into competition with natural petroleum products. As a rough approximation, the economics of the process require that 14 cwt. of semi-coke should realize the money equivalent of 1 ton of the coal carbonized, leaving the revenue from tar, light spirit, ammonia, and gas to pay cost of working, capital charges, and profit. This consideration demands that the quality of the coke residue must be such as to raise its value ton for ton nearly 50 p.ct. above that of the coal used—a condition which must be regarded as quite practicable of fulfilment. It is, however, necessary that the coal used should be clean enough to yield a high quality semi-coke, for the ash percentage of the latter will be about ten-sevenths of the former. This requirement stultifies the claims of the early and many present advocates of low-temperature carbonization, that any kind of low-grade or waste fuel can be profitably treated by the process. Another misleading statement frequently made is that low-temperature carbonization yields oils. The non-aqueous condensate obtained is, as in high-temperature carbonization, a tar, and not a straight oil. Although the tar, termed "primary tar," is usually of a thinner and more limpid kind, it still requires a special treatment for the removal of pitch from it, in order to make the oils themselves readily miscible with petroleum products—a condition on which the Admiralty, for instance, for obvious reasons insist.

Prospects of the Carbonizing Industries.

Dr. Lessing then discussed the general prospects of the carbonizing industries. The gas industry, in its 112 years of existence, he said, has undergone a slow and very gradual process of evolution. The principles underlying the major operations have remained the same. The efficiency of carbonizing has been improved considerably during the last twenty years, particularly in regard to fuel consumption and yield of products. The methods of treating the raw gas issuing from the retorts have remained almost unchanged since the time of Murdoch, the father of the industry. The possibilities of further improvement are by no means exhausted, and a great deal of work remains to be done to bring the over-all efficiency even in large works to anywhere near the possible total. A fair proportion of potential gas-making material is still subject to uncontrolled decomposition, and the recovery of bye-products is carried out in a fairly crude manner. Improvements in this direction, coupled with a further saving of coke used for heating the retorts, will tend to reduce the tonnage of coal required. On the other hand, the more efficient recovery and preparation of bye-products and the systematic isolation of materials, the value of which remains as yet unrecognized, will tend to enhance the monetary value of every ton of coal carbonized. Of immediate urgency is the improvement in the quality of coke produced and put on the market, a problem hitherto sorely neglected, and one intimately connected with the refining of the coal at the colliery. With this margin of potential technical improvements in hand, the gas industry, firmly established as it is, must be expected to continue its gradual, but sure, expansion; for the convenience of a supply of gaseous energy is being generally and increasingly recognized. Such expansion, however, does not involve a corresponding increase in coal consumption, in view of the technical economies to be effected.

The coking industry is limited in its output by the requirements of the iron and steel industry. Here, again, the most pressing need is an improvement in the quality of the coke made. Blast-furnace men are now asking themselves which are the properties of coke that are the most desirable to insist on. The object of these inquiries is the reduction in the fuel consumption of blast furnaces, and the raising of the throughput and the quality of the iron produced. Any improvements made in this direction will correspondingly diminish the amount of coal passed through coke ovens for any given production of pig iron. The possibilities of a more efficient treatment of coke-oven gas are the same as those applying to a gas-works, with the exception that coke-oven works already extract from their gas benzole, the only motor spirit (other than spirit from shale) which is produced in this country from indigenous raw materials. The surplus gas of coke ovens—*i.e.*, that portion not burned for heating the ovens—is already in many cases supplied in bulk to neighbouring gas undertakings. The reluctance of others in contracting for such gas is mainly due to their apprehension that in the event of stoppages at the mines the gas supply to towns might be cut-off. If satisfactory guarantees in this respect can be given, there is no reason why the gas at present wasted should not be used by gas undertakings as an auxiliary supply, even if it has to be piped for long distances at reasonable cost—an operation claimed to be highly efficient.

If a low-temperature carbonizing industry can be established with technical and commercial success, it should take its place side by side with the gas and coking industries, and should not be expected

to replace either or any portion of them. Its function will be to treat a portion of the 210 million tons of coal which at present are burned annually in their raw state. Even if its activities are directed to the utilization of slack only, the amount of coal carbonized may be double that used in gas making and coking, and therefore should not interfere with the supply of coal to the existing carbonizing industries. As in the older sister industries, the production of a satisfactory solid coke is the first condition for commercial success. This involves, again, the refining and possibly blending of the coal; and it thus appears that a suitable preliminary treatment of coal is a requirement common to the three types of carbonizing processes. As to the type of plant and process to be adopted, it is not likely that any one of the systems proposed and at present experimented with represents the type *par excellence* to be adopted; but it is more probable that the practical operation of a number of different designs will, according to local conditions, attain a varying degree of success, and that, by a process of elimination and modification, one or more of them will emerge as sufficiently satisfactory for general adoption.

In conclusion, he said that one important factor contributing to the present state of the coal industry is the lack of appreciation of the value of research by those controlling the industry and its ramifications. This applies particularly to the scientific, but also to the economic, aspect. On the mining side, the task of inquiring into the needs of the industry, its prospects, and lines of development has been left to individuals, some connected with the universities and other educational institutions, others in the employ of individual companies or in private practice. There has been in the past no attempt at concerted and organized research, except in isolated cases such as those of the Doncaster and the Lancashire and Cheshire Coal Owners' Association. The results of the work on safety in mines, begun by the Mining Association and continued during recent years, show the possibilities of working to a research programme conceived on large lines. It is to be hoped that the newly formed Research Association of the Mine Owners' Association will become a really live body and make up for the lateness of its formation by the intensity of its activities. On the side of coal utilization, the foundation of the Fuel Research Board has already been justified by the help given to the fuel industries and by the collection of necessary data, the value of which will be recognized when the slow-moving body of the industry becomes ready for their absorption and appreciation. The physical and chemical survey of the national coal resources undertaken by the Fuel Research Board is bound to prove of increasing value to the coal industry as more and more individual coalfields are submitted to detailed investigation. One result already obtained in the work carried out according to this ambitious programme is the standardization of methods of coal analysis; while the important question of adopting reliable methods of sampling is being investigated. Considerable activity in research in certain directions is being shown by individual firms, most of them contractors for fuel utilization plant; but a good deal of this work suffers from the lack of co-ordination and the limited resources of each concern. Inquiries into the constitution of coal and its fundamental properties are left almost entirely to the enthusiasm of private individuals. The inadequacy of work in this direction may be gauged from the fact that the number of individuals in this country independently carrying out or inspiring this class of work in connection with a material of an annual value of £250,000,000 does not exceed fifteen or twenty.

Members of the Commission questioned Dr. Lessing closely with regard to low-temperature carbonization and the suggestion that as high a price (or a higher price) must be obtained for low-temperature coke as for coal, in order to make low-temperature carbonization a commercial success, leaving the oil and other products to pay for the working of the process and provide profit. Dr. Lessing said it might be possible to induce people to pay a higher price if it were made known that this semi-coke could be burned more efficiently than coal. He agreed that a great deal of nonsense had been written about low-temperature carbonization by Members of Parliament and bankers, and, he added, he would include even some members of his own profession. It was quite certain that a great many more experiments were necessary before it could be said that any system was a commercial success; the position at present being that several processes had features of value, and these required to be brought together and co-ordinated.

MR. D. MILNE WATSON.

Mr. D. Milne Watson, President of the National Gas Council, and Governor of the Gas Light and Coke Company, emphasizing the importance of the gas industry, stated that:

The gas industry in Great Britain used last year 18,104,000 tons of coal, and made about 285,000,000,000 c.ft. of gas.

The total number of gas meters in the country is 8,278,664, and it is estimated that the number of persons using gas is 36,000,000. The number of penny-in-the-slot meters included in the above figure is 4,578,811.

The capital invested in the industry is over £160,000,000.

The number of men engaged is over 100,000, a large number of whom participate in schemes of co-partnership.

The wage roll is over £15,000,000.

The gas industry is the chief conservator of the coal supplies of the country, inasmuch as it applies the latent heat in the coal to practical purposes with greater efficiency than any other industry.

The industry provides bye-products of the greatest value to the country. In addition to the great services rendered by the gas industry in this country, its bye-products form the basis of many other industries, and are themselves largely exported, as the following figures indicate to some extent:

10,000,000 tons of smokeless fuel are produced per annum, of which about 1,000,000 tons are exported, the remainder being used in this country both for industrial and domestic purposes.

172,000,000 gallons of tar are produced per annum. A large proportion of the tar is prepared for road making and surfacing; the remainder is distilled and produces motor spirit, preservatives, disinfectants, dyes, medicines, perfumes, &c., prepared and used by manufacturers in this country. Large quantities of the creosote and pitch produced are exported.

167,000 tons of sulphate of ammonia are produced per annum, of which large quantities are exported. This is the most important of home-produced fertilizers.

The provision by the gas industry of material from which high explosives were made was one of the most important factors in winning the war.

The gas industry differs from most other industries in the following respects: (*a*) It consists of both company undertakings and municipal undertakings, approximately 500 companies and 300 municipalities. (*b*) It carries out its operations under Statute—*i.e.*, it is controlled by legislation in respect of the price that may be charged for gas and the quality or standard of gas supplied. (*c*) Moreover, in the case of statutory companies, the dividends are strictly regulated by means of a sliding-scale or maximum price and dividend clause.

A brief account was then given of the legislation under which the industry operates.

The industry is progressive and expanding, as will be seen from the following figures, dealing with statutory undertakings alone:

Dat	Coal Carbonized.	Gas Made Including Carburetted Water Gas)
	Tons.	1000 C.Ft.
1903	13,916,203	159,863,582
1913	16,640,772	219,104,842
1923	16,460,632	259,849,536
1924	17,329,180	275,225,839

Since 1903 there has been a great advance of efficiency in the carbonization of coal, with the result that a greater number of therms per ton of coal used are now obtained. This greater efficiency has been largely brought about by the research work undertaken by the industry. The necessity for research work is fully recognized.

RESEARCH WORK IN THE GAS INDUSTRY.

During the past six or seven years the Gas Investigation Committee of the Institution of Gas Engineers and of the University of Leeds have been continuously engaged upon the investigation of the efficiency of gas manufacture in different types of plant. The experiments of this Committee have been carried out on a large scale, and have a very direct bearing upon technical practice. The subjects under investigation (apart from questions affecting the utilization of gas) are:

(1) The efficiency of the manufacture of gas in vertical retorts, including a study of the influence of admitting steam to the retorts.

(2) The efficiency of the manufacture of blue water gas resulting from the interaction of steam and coke in a gas generator.

(3) The efficiency of the manufacture of carburetted water gas.

(4) The generation of steam in boilers heated by the hot gases produced in water gas plants or by the waste products of combustion which normally leave the combustion chambers of gas-retort settings.

(5) A study of the carbonization of coal in the experimental gas plant erected at Leeds as a memorial to the late Sir Corbet Woodall.

In 1907 the Institution of Gas Engineers endowed a Fellowship for gas research at the University of Leeds, and among the subjects investigated by the Fellows are the following (this work has been carried out on a laboratory scale):

(1) The thermal phenomena occurring during the carbonization of coal.

(2) The thermal decomposition of hydrocarbons during the carbonization of coal.

(3) The gasification of coke, with special reference to the behaviour of sulphur and to the formation of ammonia during gasification.

(4) The physical properties of coke.

(5) The influence of the presence of ash and the inert substances in coal upon the character of the coke produced.

During the past few years the Research Committee of the National Benzole Association and the University of Leeds have carried out experimental work in connection with various methods of recovering motor spirit from coal gas.

In addition to the above work, the teaching staff of the University and several private research students have carried out work which the industry has followed with interest. As examples of such work, the following subjects may be mentioned:

(1) The synthesis of toluene during the carbonization of coal.

(2) The decomposition of ammonia during carbonization.

For a number of years the Society of British Gas Industries and the Institution of Gas Engineers have taken an active part in research work connected with the manufacture of refractory materials, in conjunction with the British Refractories Research Association. Partly as a result of this work, the quality of material for the construction of gas retorts and their settings has been materially improved during recent years, and this has enabled gas engineers to operate their plants under higher temperature conditions, which have resulted in obtaining higher yields of gas from coal and also in economy of working due to the more rapid throughput of coal rendered possible. Assistance has also been given by members of the gas industry to the work of the Fuel Research Board, and Gas Research Fellowships at the Imperial College of Science and Technology have been endowed by the Gas Light and Coke Company and Radiation Limited.

Apart from the co-operative investigations detailed above, the larger gas undertakings are equipped with experimental plant for the investigation of the carbonization of coal in different types of

plant—*e.g.*, horizontal retorts of different shapes and sizes, vertical retorts, chamber ovens, and coke ovens. In addition to plant of this type, they have also laboratories, both for research work upon fundamental questions connected with the carbonization of coal and also for the chemical control work which is necessary for the realization of the highest efficiency in the day-to-day operation of plant. The subjects studied by the gas undertakings themselves include many of those mentioned above; and other subjects to which individual gas undertakings have given particular attention during recent years include the following:

(1) Carbonization of blended coals with particular reference to:
The production of coke of an improved quality.
An increase in the throughput of existing carbonizing plant.
The utilization of low-quality non-caking coals hitherto considered unsuitable for the manufacture of gas or coke; or alternatively the obtaining of increased yields of gas and tar from caking coals such as are used at present.
The utilization of all coke breeze and its conversion into large coke.
The conversion of pitch used in briquetting blended coals into more valuable gaseous and liquid products.
(Several large gas undertakings have embarked upon large scale trials on the lines indicated above.)
(2) The separation of ash from coal, or, alternatively, from coke.
(3) The thermal decomposition of individual hydrocarbons such as methane and tar vapours, with reference to:
The rate of decomposition.
The nature of the products of decomposition and of the equilibrium obtainable.
The influence of temperature and surface contact upon each reaction.
(4) The thermal decomposition of gas oil at different temperatures and in contact with different surfaces, to determine the effect of each factor upon the products obtained during the carburetting of water gas, with particular reference to the thermal, as distinct from the illuminating, value of the gas.
(5) The survey of large units of carbonizing plant, together with auxiliary plant such as producers and waste-heat boilers. It is a practice of the larger gas undertakings to utilize the resources of their research departments from time to time for the purpose of making a complete examination of the behaviour of large carbonizing units. This results in the detection of any waste and in modifications of the design of future plant.
(6) The purification of coal gas—*e.g.*:
The removal of naphthalene.
The removal of hydrogen sulphide by processes other than the oxide of iron process, which requires a large amount of ground space.
Various processes for the direct recovery of ammonia.
(7) The recovery of ethylene with a view to its conversion into alcohol for use as a motor spirit.

Low-Temperature Carbonization.

The gas industry has given most careful consideration to the principle, and also to the several processes of low-temperature carbonization which have been brought forward, and the industry itself has conducted experiments in connection therewith. As a result of this very thorough investigation, the industry is satisfied at the present time that none of the schemes of low-temperature carbonization is commercially practicable.

In this country coal carbonization is carried out by high-temperature processes on a large scale by the gas and metallurgical coke industries in substantially the same manner, and with similar resultant products, the aim in the one case being specially directed to the economical production of town gas, and in the other to the manufacture of metallurgical coke. In each industry the coal is treated by heating in closed chambers at a temperature of approximately 1000° C. Some 35,000,000 tons are so treated annually. A similar tonnage of coal is consumed domestically in the raw state with an efficiency of use probably not exceeding 20 p.ct., coupled with the entire loss of the chemical products, and with the production of smoke and dirt and consequent money and health losses to the community. These facts have been recognized more and more of late years; and one of the most plausible solutions proposed for the reduction of this waste and one which business men and corporations have been attacked for not embracing, is that coal should be carbonized at the low temperature of 600° C.—that is, considerably lower than in present commercial practice, for the production of an ideal smokeless fuel and recovery of the valuable bye-products, &c.

Summarized, the claims for low-temperature carbonization would appear to comprise:

(1) The production of an ideal fuel, smokeless, easy of ignition, clean, and giving a good radiant heat efficiency.
(2) The production of oils equal in value to fuel oil, upon which the nation is at present dependent from foreign natural sources.
(3) The recovery of other bye-products lost in the direct combustion of coal.
(4) The utilization of poor and fine coals now dumped, or sold at unremunerative prices.
(5) The production of cheap fuel for electricity generation.

These claims are often accompanied by generalizations concerning the reputed development of the process on the Continent and in America, unaccompanied by detailed particulars.

Historically, the process first attracted public attention in this country when Parker took out his master patent for the production of "Coalite" in 1906. The Company so formed erected works at Wednesfield, Barking, Plymouth, Hythe, and finally at Barnsley; this last having a capacity of 100 tons per day. About a year ago, too, a project was widely advertised for a large plant near Nottingham, which does not appear to have materialized. Of the other works mentioned, only Barnsley would appear to exist; and in spite of recent claims as to contracts for large purchases of the fuel, this works has, I am informed, been closed-down for several months past. Well over £1,000,000 in capital has been spent, and in 20 years no real progress appears to have been made.

It is of interest to note that one of the bye-products is a coal gas of high quality. Plymouth and Nottingham gas undertakings agreed to take gas from the Low-Temperature Company. In the case of Plymouth, after gas was supplied for a short time it had to be given up, owing to the losses incurred. At Nottingham, as has been already mentioned, nothing appears yet to have been done.

In one respect the process adopted was similar to that used by gas and coke works—namely, the coal was treated in closed vessels externally heated. In spite of technical improvement in the plant, two difficulties still beset the path of all low-temperature carbonizers, making the process expensive when compared with high-temperature processes.

(1) The travel of heat through the coal is very slow, due to the comparatively small difference of temperature between the retort walls and the initial temperature of the coal, and the conductivity of heat by coal up to temperatures of 600° C. is at its poorest.

(2) The "pasty" stage through which all bituminous coal passes during carbonization is more prominent in low-temperature systems, and means of avoiding the consequent difficulties have to be incorporated. These have to take the form of reduction of the coking qualities of the coal by admixture with non-coking coals or coke breeze, or by mechanism within the hot retort itself.

These difficulties were particularly prominent in the original systems of externally heated retorts; but in the two latest types—the Marshall-Easton and the Illingworth, at Pontypridd (the latter a 50 tons per day plant), ingenious measures to overcome them have been adopted.

An analysis of the results of the externally-heated type of plant as shown by the Fuel Research Board tests on the Coalite plant at Barnsley last year and a comparison with normal gas-works operations show:

Products.	Coalite.		Gas-Works.	
	Quantity.	Value.	Quantity.	Value.
		Shillings.		Shillings.
Gas at 4d. per therm	39·6 therms	13·20	72 therms	24·00
Tar and oils, 4d. per gallon	18·62 gallons	6·21	10 gallons	3·33
Ammonia, 3s. 6d. per butt	0·24 butt	0·84	0·28 butt	0·98
Spirit, 6d. gallon	1·78 gallons	0·89	..	..
Coke at 32s. per ton (average price)	13·23 cwt.	21·17	13·00 cwt.	20·80
Breeze at 10s. per ton	0·69 cwt.	0·34	1·00 cwt.	0·50
Gross products	..	42·65	..	49·61
Less cost of fuel for retort heating	Gas 39·6 therms	13·20	Coke 3·0 cwt.	4·80
Less cost of coal per ton	..	30·00	..	30·00
Balance for profit and working charges	..	Loss 0·55	..	Gain 14·81

The conditions under which gas undertakings operate ensure that no undue profit is made; and it may be assumed, therefore, that the balance of 14·81 shillings per ton of coal is necessary for a carbonizing operation to command financial success. To maintain such a balance in the low-temperature process would necessitate the coke produced by it attaining a price 23s. per ton in excess of that of gas coke, or 55s. per ton total. Even if the low-temperature retorts were heated by the lower-priced gas-works coke, instead of by gas as at Barnsley, an increased price of over 8s. per ton would need to be yielded. As at the present time house coal is sold at 45s. per ton, the reason for the non-commercial success of low-temperature coke is apparent. The process is capable of producing a satisfactory fuel from suitable coals at too high a price. The Gas Light and Coke Company, for example, have had practical experience on this point, as they have produced and sold some 25,000 tons of such fuel; but the production was discontinued owing to the financial loss it involved.

The difficulties attendant upon the external heating of the carbonizing chamber have led experimenters to endeavour to produce the results by passing hot gases through the mass of coal.

In this country two main types of this process are in operation:

(*a*) The type resembling a large producer in which the coal, after being carbonized in the upper part of the fuel bed, is partially gasified down below, and the hot gas drives off the products from the coal above. This type of plant is characterized by the production of large quantities of low-grade gas, by inability to deal with coals of high coking power, and by the fact that local high temperatures often prevail so that a portion of the solid product takes-on all the qualities of high-temperature coke.

(*b*) A type consisting of a rotary retort through which hot gases—either producer gas or burnt gases—are passed, and the coal is carbonized by their sensible heat. Here, again, there are large volumes of poor-quality gas produced. The coke, too, is often of a small size, necessitating either briquetting before or after carbonization.

Of the class (*a*) type there is at work the Maclaurin plant, having a capacity of 100 tons of coal daily, at Glasgow, and the Midland Coal Products plant of similar capacity at Netherfield, Nottingham. This latter plant has recently been tested by the Fuel Research Board. In class (*b*) the sole representative is the "L. & N." plant of the Sensible Heat Distillation Company at Barugh, Barnsley, having a capacity of 10 tons of coal daily. These types of plant are particularly adapted to deal with briquetted slacks or mixtures of coking and non-coking coals, but not coals of high coking quality. It is essential, too, that they should be located where a demand exists for quantities of low-grade gas of 190 to 250 B.Th.U. quality.

Where the proportion of non-coking coal used is high, the resultant cokes are friable and have often excessive ash content—a most undesirable feature in a domestic fuel.

The following statement gives particulars of the financial results to be expected:

Class.	(a)				(b)	
Process.	Midland Coal Products.		Maclaurin.		"L. & N." with Producer Gas.	
Product.	Yield per Ton.	Value. Shillings.	Yield per Ton of Coal.	Value. Shillings.	Yield per Ton of Coal.	Value. Shillings.
Low-grade gas at 1½d. per therm . . .	Therms 112·5	14·06	Therms 72	9·0	Therms 90	11·25
Oils at 4d. per gallon	Gallons 8·2	2·73	Gallons 10	3·3	Gallons 20	6·67
Coke at 32s. per ton.	Cwt. 6·38	10·21	Cwt. 10	16·0	Cwt. 6·4	10·24
Breeze at 10s. per ton	Cwt. 1·14	·57	Cwt. 1	·5	Cwt. 1·6	·80
Ammonia does not pay to recover . .	..	..	..	..	..	..
Gross value of products	..	27·57	..	28·8	..	28·96
Cost of coal per ton prepared:						
(*a*) Briquetted slack	..	21·00	..	..	..	..
(*b*) Mixed coking and non-coking	..	..	..	25·0	..	25·0
Balance to meet working charges and profit.	..	6·57	..	3·8	..	3·96

As mentioned previously, the balance found to be essential in gas-works practice is about 15s. per ton. It should be remembered that in this class of plant there is some risk of a portion of the coal being carbonized at high temperatures, with formation of the corresponding cokes and tars. It is also of interest to note that the price of gas actually credited to the Maclaurin process in Glasgow is 1d. per therm.

Oil Production.—It is generally agreed that low-temperature processes result in a yield of about 20 gallons of paraffinoid tars per ton of coal. Provided the operating temperature does not exceed 600° C., which is not always the case, the composition of these oils resembles that of natural fuel oils. Great claims as to the value of these products are made, but it is admitted that a market in them has to be created, and in any case it is difficult to see that they could command a price in excess of imported natural oil, which restricts their value at the present time to 4d. per gallon.

Utilization of Poor and Low-Priced Coals.—This claim is one strongly urged in favour of low-temperature carbonization. Assuming the claim to be justified, these coals practically always contain a high ash content which would seriously depreciate the value of the resultant cokes. Finally, while these coals may have little value when no demand exists, it is obvious that their cost would increase as soon as the demand arose, which would inevitably take away the value of the operation in the case of a process where the margin of profit is—to say the least—very small.

Development in Foreign Countries.—Much capital has been made of the supposed success of low-temperature processes in other countries. Plants are in the process of being developed in Germany for the extraction of oils from brown coals, lignites, and similar coals. These plants are not intended primarily for the production of smokeless fuel. There is no appreciable quantity of brown coal or lignite in Great Britain. As a result of very recent investigations it appears that several plants have been erected during the last five years in Germany for the production of smokeless fuel, but none of these has achieved any success. Inquiries have also been made in Germany from recognized authorities on the subject of carbonization from which it appears that there is only one plant of a capacity of seventy to eighty tons per day in operation in the whole of Germany—namely, that of the Mattais-Stinnes mines at Karnap, near Essen. A certain degree of success has attended the operation of this plant owing to peculiar local circumstances—viz., that the resultant low-temperature coke has only to compete with a high-priced anthracite fuel, which is in general use in the district for domestic purposes.

In the United States of America, the process has received attention in two directions. First, in connection with pulverized coal installations, where it has been found that the risk of spontaneous combustion and explosion is diminished by preliminary carbonization of the coal and pulverization of the resulting coke—a notable example being that of the Ford Company's plant using the Caracristi method of carbonization by a bath of molten lead.

Secondly, in the manufacture of steel, the low-temperature carbonization process is used for the purpose of making high-quality producer gas. This is a matter for a steel works, and is not applicable to general colliery practice.

Electricity Production.—Here, the problem is similar to that which is to be found in the steel works in America, which has just been referred to. It is claimed that the low-temperature process of carbonization might be useful in the production of electricity upon the ground that it would enable low-grade coals to be treated in such a way as to make such low-grade fuel of equal value as the untreated coal for steam raising purposes, and would also provide producer gas for heating. Certain residuals would also be obtained. The successful application of low-temperature carbonization to electricity production rests upon the possibility of obtaining heat energy from some of the gas, oil, or coke products resulting from the treatment of a suitable coal, at a price less than the present cost of such energy obtained by the combustion of raw coal. It is obvious, too, that the return from products other than those selected as fuels in the generation of electricity must be sufficient to cover the whole of the costs and necessary heat losses incurred in carbonization. It is difficult to see how a process which is financially unsuccessful by itself will be of benefit as an adjunct to the electrical industry.

SUMMARY.

It would appear that low-temperature carbonization has been actively investigated and experimented with in this country for the past twenty years. Capital has not been lacking, and many of the initial difficulties in technique have been overcome. Nevertheless, the plants in operation are all comparatively small units, and the undertakings give no indication either of expansion in business or of financial success.

There would probably be a demand for a limited quantity of low-temperature smokeless fuel if some process could be found which would permit it to be sold at a price which could compete with other fuels such as gas coke and coal. Such a fuel must be suitable for ordinary handling and transport, and have a low ash content. At present most low-temperature cokes are very friable and consequently difficult to transport. The only way to get over this difficulty is to select the coals and to blend them.

With regard to the gaseous and liquid products, these no doubt can be marketed, but at certain prices. It must be remembered that the residual market is already glutted, some products being practically unsaleable. Moreover, any increased production of such residuals would further reduce the price. Again, such products will be in competition with foreign-produced natural oils which are in the hands of very powerful combines.

The alleged successes abroad are seen, on examination, to be specialized developments in relation to some other definite requirements; and in so far as such requirements are to be found in this country, it might be feasible to adopt a similar policy. To seek to apply such specialized developments to the coal of this country generally would be purposeless.

It is possible that in the future a successful method of low-temperature carbonization may be invented so as to effect a conversion of low-grade fuel into an improved and better form of fuel. At the same time, it is extremely doubtful whether a policy of carbonizing low-grade fuel (containing as much as 20 to 40 p.ct. of ash) is not a mistaken one. It is more than probable that it would be more expedient to pulverize such fuel completely, and use it under boilers in conjunction with coke. This course is one which has already been adopted by a large number of manufacturing firms.

Gas undertakings are not opposed to low-temperature carbonization. They are constantly trying new methods of carbonization. All large works have many processes of carbonization in operation. If a visit were paid to such works it would be seen that many different processes of carbonization were in operation at the present time. The gas industry is only too willing to take up low-temperature or any other system of carbonization, provided it is found to be commercially possible to do so.

Continuing his main evidence, Mr. Milne Watson stated that coal being the basis of the gas industry, it is of paramount importance to every gas undertaking: (*a*) That it should be able to purchase its coal as cheaply as possible; and (*b*) that it should have freedom of choice in selecting the most suitable coal for the manufacture of gas.

With regard to the price of coal, generally speaking, it could be taken that an increase in the price of 1s. per ton means an increase of 1d. per 1000 c.ft. in the cost of gas. Any increase in the price is a material factor in the cost of living, as gas is in universal use in the homes of the people. It is essential for the purpose of maintaining a low price for coal that there should be free competition between the different collieries, so as to enable gas undertakings to buy the most suitable coal as cheaply as possible. To-day, if a colliery wished to charge unreasonable prices, or was found to be supplying coal of unsatisfactory quality, the gas undertaking can—and does—go to another colliery. This necessitates consideration by the seller of the customer's interests, both as regards price and quality. With regard to freedom of choice in selecting coal, it was pointed out that there is a great variety of coals, some of which are suitable for steam-raising, some for gas manufacture, some for domestic purposes, and some for the production of coke. Gas coals are distributed over most of the coalfields, but even among the gas coals great differences exist in their value for gas-making purposes. Furthermore, there is also a very great variety of plants in operation throughout the country, which are utilized in the manufacture of gas. Most of these plants have been selected as giving the most efficient results from the coals readily available. By changing the coal, the output of the plant might be reduced, in practice, by as much as 20 p.ct. Therefore the gas industry urged the Commission to make no recommendation which might result in any increase in the cost of coal, or which might restrict any gas undertaking in its freedom to select the most suitable coal for its particular needs, as any such course would in their opinion prove detrimental to the interests of the industry and those whom it serves.

Answering questions by the CHAIRMAN,

Mr. *Milne Watson* said that in 1903 the output of gas per ton of coal was about 62 therms, but by improvement in the method of carbonization with horizontal retorts, this had been increased to 72 therms. With the modern vertical retorts the figure was 80. That increase of efficiency, of course, decreased the demand for coal below what it would otherwise have been, but against this the gas industry had stimulated such a demand for gas in many directions that it was really doing the coal industry a service in increasing the demand for coal.

Discussing his general conclusion that low-temperature carbonization is not at present a commercial success, Mr. Milne Watson said he had recently sent a representative to Germany to find out what is going on there, and what the views are regarding it, and his

conclusion was based upon the information he had received in the report of his representative who had been given information by many people in high places, and those best qualified to know. So far as plants in this country were concerned, he had been told that the Maclaurin plant at Glasgow was working at a loss of 7s. or 8s. per ton. His engineer who had been to Germany had told him that the German engineers were looking to total gasification plants rather than to low-temperature carbonization and the production of a solid fuel; and the fact that the plant at the Mattais-Stinnes mines had been successful was due to the fact that solid fuel was required in the district, and it was comparatively easy to make low-temperature carbonization a success where there was no competition. This plant, however, was the only one in practical operation in Germany that could be described as a success. The conditions in connection with this plant, however, brought out the fact that low-temperature carbonization could possibly be used on coals of a special nature; but this was not the case in this country. If there was a class of coal practically useless in the ordinary way, and it could be made, by low-temperature carbonization, a useful coal, then there were prospects for low-temperature carbonization. In this country, however, there were large quantities of good coal for gas-works and steam-raising and domestic purposes, and therefore low-temperature coke had to compete with existing fuels. The experiment carried out by the Gas Light and Coke Company, when 25,000 tons of coke were made by such a process, was successful for a short time during which enthusiastic people used it, but they eventually refused to pay more money for it than they could buy ordinary coke or coal for. It was difficult to see how low-temperature carbonization could establish itself in this country on the hypothesis that a higher price was to be charged for the coke than for coal.

The CHAIRMAN: It has been suggested that you may get a high price on the ground that this coke can be burned more efficiently than raw coal.

Witness: I do not think that is so.

Witness, continuing, said he had been told that the Ford low-temperature carbonizing plant, which was installed for very special purposes, had been given up.

The CHAIRMAN asked if the position was that there were many technical difficulties yet to be overcome, but which might be overcome.

Witness said this was so, and he believed they would be overcome. As a matter of fact, a great many gas-works had carried out experiments, including the Gas Light and Coke Company and the undertakings at Huddersfield, Nottingham, Glasgow, Cardiff, Dover, and Kettering, and the industry generally was constantly experimenting, though mostly with negative results so far as the financial position was concerned.

The CHAIRMAN: And I gather that even if these technical difficulties were overcome, the nature of the case is such that commercial success is improbable?

Witness said this was so on a large scale unless some means were found for inducing people to pay a higher price for the smokeless fuel than they had to pay for coal.

A general explanation was then given of the working of the Gas Regulation Act and of the sliding-scale, it being stated that on the whole the latter is operating satisfactorily, and at the same time offering every inducement to the gas undertakings to lower their prices in order that higher dividends might be paid.

On the question of research, witness said it was felt that this had, on the whole, been remunerative, and the industry proposed actively to continue this research work. The National Gas Council paid £7000 a year for research work, and his own Company expended £10,000 a year, apart from the contribution of the National Gas Council. Altogether, a sum of between £50,000 and £100,000 was expended annually by the industry upon research.

Witness was then questioned as to the present system by which those desiring to buy coal can do so in a freely competitive market. He said he did not favour any form of control of the coal industry, having in mind the unfortunate consequences of Government control during and immediately after the war. In those days from 20 to 30 p.ct. of ash was common in the coal his Company purchased, and in one case it rose to as much as 39 p.ct. If coal were again to be sold under those conditions, it would mean that the ships in the Tyne might be loaded from twenty different sources, and when it reached London and was tested it would be impossible to get at the particular owners to complain. This sort of thing was disastrous because of the cost of transport of this large percentage of dirt and the fact that it made the coke very bad afterwards. These conditions would recur, he believed, under State management of the coal industry. At the present time, the average ash content of the coal which his Company purchased had been reduced to 8·4 p.ct., as the result of careful testing and negotiation with the colliery companies, though before the war the percentage averaged 6·3 p.ct. There was a great advantage in buying coal consistently from definite collieries, as the chemists at the gas-works then knew what they were dealing with, whereas otherwise it meant constant regulations and alteration of the plant to use varying classes of coal. If coals were graded into classes, it would be impossible to know where the coal actually came from. Coals from all over the country might be put into a particular grade and mixed together, and the gas industry would never know where it was.

The CHAIRMAN: Has the industry as a whole any views as to the nationalization of the coal industry?

Witness: The industry is against nationalization, for the reasons I have given.

In answer to further questions, witness said he could give no reason for the fact that the amount of ash at present is about one-third more than it was pre-war. As a matter of fact, the colliery companies claimed to be paying greater attention to the cleaning of coal. At present coal was not bought on a guarantee of quality by analysis, though his Company did buy on value to the extent that the coal was always being tested in the laboratories and on the plant, and in this way the quality of coals from various sources was known. This, of course, was not the same as buying by analysis under a penalty.

The CHAIRMAN said he had seen a form of contract in the textile industry in which coal was bought on calorific value under a guarantee.

Witness said that would be a very good thing if it could be done in the gas industry; and greater interest was being taken in that aspect of the matter. He did not know of any gas undertakings, however, which were buying on such a basis.

The CHAIRMAN: It has been suggested that the methods of marketing coal in Germany are more scientific than ours, but I gather from you that our system works-out better.

Witness: Yes, normally it does.

In answer to questions by other members of the Commission,

Mr. *Milne Watson* said that some gas undertakings purchased their coal through factors, though many purchased direct from the collieries. The ideal method of treating coal, in his opinion, was that it should be treated before use for any other purpose. In that way it could be used in conjunction with electricity supply; but it was difficult at the moment to do this. At the same time, electricity undertakings to-day used a large quantity of coke and coke breeze instead of coal. At present, when coal was carbonized there were obtained about 13,000 c.ft. of 540 B.Th.U. gas, 15 cwt. of coke, of which 3 cwt. were used in the next step in gas making, leaving 12 cwt. of coke, of which 2 cwt. were coke breeze. There were also tar, sulphate of ammonia, and other bye-products. On the other hand, when raw coal was burned, only about 20 p.ct. of the heat value was usefully employed, the remainder going up the chimney; and there was a waste of the valuable bye-products.

Sir WILLIAM BEVERIDGE said that at present the householder paid 10d. per therm for his gas, as compared with about 2d. per therm when buying coal, though he did not, of course, get anything like the same amount out of the coal.

Witness said that 10d. per therm was rather a high figure to take for gas. At the same time, the real advantage of gas to the householder was that he could turn it off when he desired to, and it was clean.

Witness, dealing with the prices paid for coal by the gas industry, again took the case of his own Company. For the best coal, his contracts were at prices from 20s. to 21s. per ton now, compared with 13s. 11d. before the war, both f.o.b. the Tyne. Cheaper coal now cost about 18s. per ton. Freights, too, were up compared with pre-war. An offer was recently made to him for coal for delivery up to May next, when it was expected that the subsidy would end, and the price was 16s.; and he attributed this lower offer to the effect of the subsidy, and not to the ordinary law of supply and demand. As a matter of fact, foreign buyers at the moment were getting the advantage of cheap British coal, and the home buyers were paying a high price.

During the course of further answers, it was stated that there would not be much advantage in using flaming coke from low-temperature carbonization processes as compared with coal, and it was difficult to see how the householder could be induced to pay a higher price for this flaming coke.

If, added Mr. Milne Watson, they could find any possible chance of adopting low-temperature carbonization, the gas industry would be the first to do it.

Sir WILLIAM BEVERIDGE: You are not very hopeful that the public will learn to use more gas coke?—Not unless the price can be made lower.

The greatest possible additional service which you could render to the country is, I think, to make low-temperature carbonization a business proposition. The gas industry would be more likely to do this than anyone else because, as an industry, it would have nothing to compete with it. At the same time, if you took this up and succeeded, it still would not help us as a Coal Commission. It would not increase the demand for coal.

Mr. *Milne Watson* replied that he did not see how it could.

Witness said a suggestion had occurred to him that might help the present position—viz., a modification of the subsidy principle by which payments should be made to owners of inefficient collieries to close them down while times were bad, these payments to be in the form of loans to help to maintain the collieries in a position to be worked again when trade was good and the demand greater. He had heard, for instance, that it required £1000 per week merely to keep a pit in a condition to be worked when there was a demand for coal. Such payments would not be for ever. It would be impossible to do this without some tribunal which would decide on the pits to be so treated.

Sir WILLIAM BEVERIDGE: You appreciate the difficulty of distinguishing between pits?—Yes, that is why I suggested there would have to be a tribunal.

Mr. COOK then put questions on behalf of the Miners' Federation, and first suggested that in opposing nationalization witness was not speaking for the municipalities owning gas undertakings.

Mr. *Milne Watson* said that there were 624 companies and 214 municipalities represented on the National Gas Council, and there were municipal representatives as well as company representatives on the Executive Council of that body. Though he had not canvassed every individual member, the Executive Council had discussed this matter, not as one of politics, but as a purely business problem, and it had expressed itself opposed to nationalization.

Mr. COOK: You do not suggest that it is politics with us when we cannot get normal wages, and the owners say they are not making any profits?—No, but I mean that we discussed the matter as ordinary business men.

In answer to further questions, witness explained the general position of the Gas Light and Coke Company. Mr. Cook inquired as to wage arrangements, and directed his questions to showing that there is a guaranteed week, practically speaking, that holidays are allowed,

and generally that the conditions are better than in the coal industry. He also asked for, and obtained, the figures of the dividends paid by the Gas Light and Coke Company since 1909. Mr. Watson showed how the dividend at present was £4 17s. 4d. p.ct., as against £4 13s. 4d. in 1909.

Mr. COOK: I take it that the Directors of gas companies are very much interested in coal companies?—None of my Directors.

Mr. *Milne Watson* was then questioned as to the efficiency of municipal gas undertakings, and expressed the view that they are as efficient as company undertakings, and that the charges for gas in both cases are very much the same.

Mr. COOK then took up the price of coal, and ascertained from witness that the cost of coal in the gas industry is about 20 p.ct. of the total cost of gas making. Mr. Watson repeated his previous statement that he preferred a free market and competition among sellers of coal. In this way the price of coal was kept down.

Mr. COOK: Therefore, while competition to reduce the price of coal is good, there is no competition among gas companies so that the price of gas may be reduced.

Mr. *Milne Watson* reminded Mr. Cook of the influence of the sliding-scale in this connection.

Mr. COOK: The coal owners say they are making no profits, the miners are getting miserable wages, and there is an enormous amount of unemployment. Would you seriously suggest, in these circumstances, that there should not be an increase in the price of coal?—Certainly. From the point of view of the gas industry, we should regret very much an increase in the price of coal. The price that I am paying for my coal now is very serious indeed.

Mr. COOK: Do you suggest that it would not be better for the coal industry, the same as in your industry, to have some form of co-ordination, and do you seriously suggest that you could not get an efficient service and supply of coal both in quality and in price by nationalization?—My view is that nationalization has such serious drawbacks that it would prevent us buying the right coal for our purpose.

Mr. COOK reminded Mr. Watson that he had stated that municipal gas undertakings were as efficient as company undertakings. Why therefore, he asked, should there be any difference when it came to nationalization of the coal industry?

Witness replied that municipal gas undertakings were working on a very much smaller scale, and in local areas, whereas the nationalization of the coal industry would mean a huge undertaking dealing with the whole of the country. Municipalization was very different from nationalization.

Mr. COOK: I say that nationalization would be more efficient.

Witness said he had not come forward to explain away the difficulties of the coal industry; but the differences in the quality of coal not only in various districts but even in the same pits would render it very difficult, under nationalization, for the large buyers to obtain the coal they required.

Mr. COOK suggested that it would be better for the Government to have the advantage to be derived from the ownership of good collieries rather than merely having to pay, as Mr. Milne Watson had said, under his proposal, for the bad pits.

Mr. *Milne Watson's* reply was that his suggestion was intended merely to carry them over the present difficult time until the period when a good many of the pits, at any rate, could be put into operation again.

Mr. COOK's next question suggested that the amalgamation of the railway companies had helped the gas industry, presumably by lower freights.

Witness replied that this was by no means the case. Before the amalgamation, the companies were anxious to get business, and keener to do it than they were now. The hoped-for reduction in freights had not eventuated.

Mr. COOK: Would it be fair to put this question? Your only desire in coming before this Commission, irrespective of the lack of profits of our friends opposite, and the wages of the miners, is a reduction in the price of coal?

Witness: I do not subscribe to that in any form.

Mr. COOK: You do not want any increase. Let me put it that way.

Witness replied that the gas industry believed it was serving the interests of the consumer exceedingly well, and his principal interest must be to guard the interests of the consumer. In doing this he was guarding the interests of the gas industry, which meant that he was practically guarding the interests of the country as a whole. He was sorry that the coal industry should be in difficulties. The Commission had been appointed to see if it could find a way out of the difficulty, and he had only sounded the note that whatever the Commission did they should have regard to the effect of the price of coal, because, if the price of coal were increased, it would affect 36 million people who used gas in their daily life. If these people were adversely affected, it would injure the working classes engaged in other trades. Therefore, it was necessary to be very careful what was done to help a particular trade, if it were going to interfere with the national well-being, as would be the case here. He believed he had made it clear that it was not the gas industry itself that he was speaking for; he felt that he was trustee for the vast multitudes of people who were supplied with gas.

Mr. COOK suggested that other industries should adapt themselves to the mining industry, having regard to the conditions.

Witness said he could not subscribe to any suggestion that the gas industry should be guided by the position of the coal industry.

Mr. COOK: Do you suggest that we should be subservient to the gas industry, and that we should continue with low wages and the owners with no profits, as they allege?

Witness replied that he considered he was paying a very good price for coal at the present time—one which was ample to keep the coal industry going. Surely it could not be suggested that 20s. 9d. per ton was a bad price.

Mr. COOK: Do you know that the average cost of producing coal at the pithead last month was 15s.?

Witness: If I am paying 20s., then I am paying enough.

Mr. EVAN WILLIAMS then put questions on behalf of the Mining Association of Great Britain. His first questions were as regards the suggestion that wages are higher in the gas industry than in the coal industry; and he put it that, if account was taken of the allowances of coal to miners, of free houses, and of absenteeism, the relative wages would be very much nearer than was shown by the actual figures. If, said Mr. Williams, there was 6 to 7 p.ct. absenteeism in the gas industry—which means about a month per man per annum—the gas industry could not afford to allow their men a week's holiday each year.

Witness agreed.

Answering further questions, witness agreed that the position as regards ash was worse during the war than at any other time, and he did not complain of that. Generally speaking, there had been an improvement since, but the fact remained that there was a slightly higher percentage of ash now than before the war.

Mr. WILLIAMS then asked what was the percentage of labour to the total cost of gas making.

Witness said it was about one-third.

Speaking of the offer for coal at 16s. per ton up to May next, a price which he associated with the effect of the subsidy, witness remarked that the Germans had a large quantity of coal to dispose of, and he agreed that this would have a depressing effect upon prices. The subsidy, however, had helped collieries to quote lower prices. A fundamental reason for the lowering of prices, however, was the excess of supply over demand.

Mr. EVAN WILLIAMS: At the same time, you can understand the reluctance of any colliery to quote prices for after May next, owing to the uncertainty.

Witness said he could, and he did not blame the coal owners for it. It seemed but common-sense.

In answer to further questions, witness said he did not regard low-temperature carbonization as likely to assist in improving the coal mining industry either at present or in the future. If at any time it became successful, he rather felt that the plants would have to be put up at the collieries—with special reference, however, to the local conditions—rather than at a large station or stations away from the collieries. In any case, it would rather tend to decrease the quantity of coal required for ordinary purposes.

In answer to Mr. KENNETH LEE (a Commissioner),

Mr. *Milne Watson* said that, as things stood at present, it appeared that, to make low-temperature carbonization a successful commercial proposition, it was necessary that the semi-coke should fetch about 8s. per ton more than coal.

Sir WILLIAM BEVERIDGE put it that the price of gas had gone up in about the same proportion as the price of coal, wages had gone up more, and the shareholders were receiving the same dividend. This suggested that labour had been favoured rather than capital.

Witness said this was what had happened in the case of the Gas Light and Coke Company.

Mr. COOK, referring to the statements as to ash in coal, said that during the Control period the Government took no part in the running of the collieries, so that the whole responsibility rested upon the owners in that respect.

In another question, Mr. COOK said this 10 million tons of coal in Germany had been mentioned many times during the past two years. Where was it?

Mr. *Milne Watson* said he had made inquiries, and understood that it was in Westphalia.

Mr. COOK finally said that the quality of German coal was much lower than British, and would not stand storing for any length of time. Moreover, men had been dismissed from the German mines, and the output regulated according to the demand.

Mr. *Milne Watson* said he believed this was so.

LABOUR SAVING IN SUBSIDY HOUSES.

The statement of the National Housing and Town Planning Council that 200,000 houses must be built annually for the next twenty years before the housing problem is solved, reminds one (writes a correspondent) that some of our leading building firms are setting a noteworthy example to housing authorities by producing well-finished and admirably-equipped houses at remarkably low prices. In Surrey, for example, on the fringe of the Downs, a garden village of subsidy houses is springing-up, in which smoke is reduced to a minimum and the labour-saving devices of much more expensive modern homes are brought within reach of people with working-class incomes.

Although only just over 11 miles from London, the houses, which are semi-detached, are built on generous sites, 30 ft. by 150 ft. There are only nine houses to the acre. Constructional economies and large-scale operations have enabled the builders to sell these six-roomed houses, complete with gas cooker and 8-gallon portable gas boiler, for £725, less the subsidy. An innovation in construction, which has reduced the cost of material and labour, and, at the same time, provided additional floor space, is the introduction of a narrow flue built for gas-fires. The front bedroom in each house is equipped with a gas-fire mantel register, while gas points are laid in the drawing room and back bedroom.

So popular are these houses that 150 have already been completed, and many more have been sold for completion as late as March.

The Judgment of Paris.—The Paris Municipality have paid a compliment to the art of British gas fire makers by purchasing from a British firm (Radiation Limited) a high-class silent gas fire, designed to represent the Florentine period, for the Hôtel de Ville.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The strength of the market has been fully maintained during the past week, and in some sections the demand has still further increased. It is difficult to say exactly where it is all coming from; but there is a general good inquiry all round, due undoubtedly to the more attractive and competitive level at which prices have stood since the operation of the subsidy. The fact that, even with this help, this district made a loss in the month of August, is evidence of the enormous difficulties still in front of the industry. But the rapid improvement in the volume of trade shows, as the owners have always contended, that, at economic prices, we can always get our full share of the world's coal trade.

There have been signs lately that we are still up against keen competition, and there have been several instances of orders being lost through prices being just too high.

The Durham market has been the feature this week, with coking makes and second-class gas both going ahead. Unscreened coking is quoted from 14s. 6d. to 15s. 6d. under steady demand. Wear Special gas makes have been steady at 16s. 6d., and best qualities quote from 16s. 3d. to 16s. 9d., while second-class gas has been prominent at 14s. 6d. to 14s. 9d.

Coke is still in good demand, but business is said to be restricted by shortage of available supplies. Gas makes are called 23s. to 24s. 6d. f.o.b., and patent foundry sorts are 22s. 6d.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Owing to the mild weather, the house coal trade of Yorkshire and Lancashire is experiencing some difficulty, and collieries generally are not working as well as could be expected at this time of the year. London and the Southern Counties are equally affected, while screened coal for export is also moving rather slowly.

There appears to be a more optimistic tone among industrial users, but up to now there has not been any apparent effect in the quantity consumed.

Gas coals move freely under contract; but prices show a tendency to decline for immediate "spot" business.

The export market is somewhat spasmodic, best Yorkshire hards having depreciated slightly, while washed nuts and smalls continue firm. The normal demand for gas and furnace cokes from the Scandinavian countries is now operating, with the result that prices for both commodities are firmer.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 18s. to 18s. 3d.; screened gas coal, 17s.; washed trebles, 19s. to 20s.; washed doubles, 18s. 3d. to 18s. 6d.; washed singles, 17s. 6d. to 18s.; washed smalls, 13s. to 13s. 9d.; unwashed doubles, 15s. 9d. to 16s.; rough slack, 9s. to 9s. 6d.; smithy peas, 18s. to 20s. per ton. West Yorkshire—Hartleys (f.o.b. Goole), 16s. to 18s.; screened gas coal, 16s. 6d.; washed trebles, 18s.; washed doubles, 17s.; washed singles, 16s. to 16s. 6d.; washed smalls, 12s. 6d.; unwashed trebles, 17s.; unwashed doubles, 12s. 6d. to 13s. 9d.; rough slack, 9s. 6d.; coking smalls, 9s. per ton. Derbyshire and Nottinghamshire—Top hards, 19s. to 19s. 9d.; washed trebles, 18s. 6d.; washed doubles, 17s. to 17s. 6d.; washed singles, 16s. 6d.; washed smalls, 12s. 6d. to 13s.; unwashed doubles, 13s. to 15s.; rough slack, 9s. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 15s. 6d. to 17s.; gas coke, 22s. 6d. to 26s.; furnace coke, 21s. 6d. to 22s. per ton.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Trade continues sluggish in all branches. Further checks have had to be put on output. A number of collieries which were working up to five days a week are now idle for two days a week or more. There is considerable congestion in the distributive channels. Merchants have their wharves full, and are consequently not clearing wagons without a good deal of delay. Local railway junctions are blocked with coal in the mining districts, and there is little sign of the traffic being relieved. The demand for industrial coal is improving, very slowly but perceptibly. There is still a glut of smalls, and spot lots are offered at a shilling or so below the October minima. Slacks can be picked up very cheap.

With lower temperatures house coal is receiving slightly more attention; the expansion is much less considerable than is usual at this season of the year. There is a steady absorption of the best grades; medium and low grades are superabundant, and values suffer accordingly.

Blast-furnacemen are narrowly watching developments with regard to slack. In the event of the Lancashire textile trade making the recovery which is predicted, smelting coke would almost certainly become dearer with the absorption of the slack which is now a drug on the market.

TRADE NOTES.

New Holder for Stanmore.

Messrs. Clayton, Son, & Co., Ltd., have just received from the Gas Light and Coke Company, London, an order for a four-lift spiral guided gasholder of 1 million c.ft. capacity, for their Stanmore depôt.

CONTRACTS OPEN.

Retort Material.

The Gas Department of the Stockton-on-Tees Corporation are inviting tenders for refractory materials for two beds of retorts. [See advert. on p. 381.]

Inquiry at Brighouse.

At Brighouse, on Nov. 3, Mr. H. R. Hooper, Inspector for the Ministry of Health, conducted an inquiry into the application of the Brighouse Corporation for power to borrow £25,000 for new plant to be installed at the gas-works. The Town Clerk (Mr. P. T. Grove) submitted the application, and was supported by Mr. C. R. Ingham, the Gas Engineer. There was no opposition. Mr. Grove said the existing plant was installed 26 years ago, and was now fully paid for; but it had become out of date and difficult to maintain. The Gas Committee were unanimously in favour of installing new horizontal retorts, together with coal and coke handling plant. The total output of the works in 1921 was 162,450,000 c.ft., sold at 4s. per 1000 c.ft.; the following year, 158,990,000 c.ft., sold at 4s. 6d.; and last year, 186,881,000 c.ft., sold at 3s. 1d. It was estimated that the demand five years hence would be equal to 250 million c.ft. Following the inquiry, the Inspector visited the works at Mill Lane.

Southport Gas-Works Extensions.

At a meeting of the Southport Town Council on Tuesday, Oct. 27, the Committee were authorized to make application to the Ministry of Health for their sanction to the borrowing of £40,000 for the provision of additional vertical retorts, coke handling and clinker handling plant, and the establishment of a showroom. Since the meeting of the Town Council Mr. John Bond, Manager and Engineer, has issued a report in which he says the increase in the manufacture of gas has steadily advanced since the last expenditure of £21,099 on carbonizing plant in the year 1912. The Gas Department propose that the plant used in the carbonization of coal should be extended; and after carefully considering the question, advise an extension of the vertical retort system, so that it would be capable of supplying the whole of the gas during the summer months. Since the last extensions of plant in 1912, the consumption of gas has increased by 150 million c.ft. per annum, and the maximum consumption of gas per day for the year ended March 31 was 2,700,000 c.ft. Mr. Bond anticipates the maximum this year will be over 2,800,000 c.ft., and the maximum for next year above 3,000,000 c.ft. Mr. Bond points out that the capital expenditure of the estate in 1904, the year of his appointment, was equivalent to 12s. per 1000 c.ft.; to-day it is only 3s. 7d. per 1000 c.ft. of gas sold. He estimates the cost of four settings of vertical retorts would be £35,000. The Gas Committee have favourably considered the fuel-saving device of a magnetic separator of coke from clinker, and they are fully alive to the fact that a better service could be given in the grading and treatment of coke for public use. Mr. Bond estimates a gross revenue, from a capital expenditure of £40,000, of £14,604—£8800 of which would be absorbed in interest, sinking fund, and repairs on a capital expenditure of £40,000 at 22 p.ct., thus effecting a net saving of £5804. On the total gas manufacture, this represents approximately 2d. per 1000 c.ft.

Accident at Maryport Gas-Works.—On Oct. 30, Mr. Thomas Harris, Manager of the Maryport Gas-Works, ascended a ladder at the works, to put a belt on a pulley. His clothing caught in the machine, and he was whirled round fifteen times before the engine could be stopped. Mr. Harris, who was injured, saved himself from death by clinging to the shaft.

Underground London.—Mr. W. J. Liberty, Inspector of Public Lighting for the City of London, gave an interesting illustrated lecture to an appreciative audience at the Cliff Town Literary and Musical Society, Southend-on-Sea, last Wednesday—depicting underground London in modern and ancient times. Mr. W. P. Bicknell, Principal Clerk to the Public Health Department of the Corporation of the City of London, presided.

Cheaper Industrial Gas at Colne.—The Borough of Colne Gas Department announce a reduction in the price of gas for industrial purposes other than lighting. As from the meter readings at the end of the present year, the charge will range from 9¼d. per therm for a quarterly consumption of less than 105 therms down to 6¼d. per therm for a quarterly consumption of between 2100 and 4200 therms. The special rate for gas engines is now withdrawn. The above scale does not apply to suction gas users who are intermittent consumers of coal gas.

Hornsey Gas Company's Special Order.—Last July the Parliamentary Committee of the London County Council reported that the Hornsey Gas Company had made application to the Board of Trade for a Special Order under the Gas Regulation Act, 1920, conferring new powers on the Company; that these powers might affect prejudicially certain of the Council's tramways; and that the Committee had accordingly given instructions for notice of objection to be lodged. The promoters withdrew the clause to which objection was taken; and it was consequently not necessary for the Committee to pursue the Council's objection.

Price of Gas at Clayton.—The Clayton Urban District Council—a body who are leaving no stone unturned to get a supply of electricity from Bradford or anywhere else—have carried unanimously a resolution to petition the Bradford Corporation Gas Department for a reduction in the price of gas supplied to the district. Under agreement between the Corporation and the late Clayton, Allerton, and Thornton Gas Company, when the Corporation took over the latter undertaking many years ago, the charge to Clayton consumers was to be not more than 8d. per 1000 c.ft. above the price to Bradford consumers. Bradford had promised that if, and when, Clayton became incorporated with Bradford the price would be the same as to Bradford consumers; but though negotiations with a view to the amalgamation had been more or less in progress for a considerable time, there is no definite sign of its being brought about yet, and the local Council contend that it is high time there was a reduction in the price of gas.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 9.

There is a fair amount of inquiry for pitch, and the market is decidedly firmer at about 42s. 6d. per ton.

Creosote also is firm at from 7⅛d. to 7¼d. per gallon net and naked at works.

Tar spirits and other products continue unchanged at the prices last recorded.

Tar Products in the Provinces.

Nov. 9.

The markets for tar products generally remain steady.

In pitch, some business continues to be reported on the basis of current quotations. While there appears to be no pressure whatever to sell on this side, there is not very much demand from the Continent.

Creosote is firm, and there is a fair amount of inquiry for both prompt and forward delivery.

Water-white products are steady, but without any change in prices.

There is a further improvement in the demand for cresylic acid, although prices are still poor.

Naphthalene and anthracene are still neglected.

The average values for gas-works products during last week were: Gas-works coal-tar, 29s. to 34s. Pitch, East Coast, 41s. to 41s. 6d. f.o.b. West Coast—Manchester, 35s. 6d. to 36s. 6d.; Liverpool, 36s. 6d. to 37s. 6d.; Clyde, 30s. to 40s. Benzole, 90 p.ct. North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.ct., at 120° C., 1s. to 1s. 1d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 7½d. to 1s. 8½d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8½d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 6½d. to 6⅝d.; salty, 6d. to 6⅛d.; Scotland, 5⅞d. to 6d. Heavy oils, in bulk, North, 6½d. to 6⅝d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Increased Discounts at Tipton.—Increases in the discount allowances for power and lighting consumers of gas were announced at a recent meeting of the Tipton Urban Council, when the Gas Committee recommended that the discount for prompt payment to ordinary consumers be increased from 5 to 10 p.ct., to prepayment consumers from 8½ to 12½ p.ct., while power consumers are to get 10 p.ct.

Kendal Gas Results.—In his report on the working of the Kendal Gas and Water Department for the year ended March 31, Mr. W. R. Wilson, the Engineer and Manager, states that the Gas Department's net profit amounts to £79. The total quantity of gas made was 116 million c.ft.—an increase of 4·08 p.ct.; and the amount of gas sent out was 104 million c.ft.—an increase of 3·13 p.ct. There are at present 2101 ordinary and 2243 prepayment consumers on the books, showing an increase of 41 over last year.

Edinburgh Gas Department.—The gross revenue for the year ended May 15 was £609,593, which left a deficiency of £27,111 on the year's working, compared with a deficiency of £69,809 last year, when the gross revenue was £650,700, and the price of gas 4s. 2d., 4s., and 3s. 8d. per 1000 c.ft. The present price is 3s. 8d. and 3s. 6d. per 1000 c.ft. The total quantity of gas sold was 2599 million c.ft., compared with 2528 millions in the year ended May 15, 1924. The number of consumers shows a marked increase, as also does the number of appliances—cookers, fires, &c.—in use.

Doctor's Testimony to Gas Fires.—A compliment was paid to the Corporation Gas Department at a meeting of the Darlington Town Council last Thursday. Dr. Fisher, a member of the Council, said he wished to refer to a smart piece of work which had been done by the Department. A telephone message was sent to the Manager asking that a gas fire should be fitted in a sick person's bedroom; and within two hours the gas fire was burning in the room. Many people, the doctor continued, considered gas fires unhealthy, and no doubt the old installations were; but the new gas fires were "quite all right." They were easy to work, and there was no noise or smell.

Ideal Homes Exhibition at Swansea.—The Swansea Gas Light Company had a very striking exhibit at the Ideal Homes Exhibition held at the Drill Hall, Swansea, from Oct. 21 to 31, and were again successful in obtaining—through popular ballot—the Gold Medal and Certificate, presented as First Prize by the exhibition promoters. The stand was over 60 ft. long, and was tastefully decorated. Various apparatus were shown, some in working order. Space was reserved at one end for a coke display; this section being surmounted with a sign "Use Coke and Abolish Smoke." The exhibit was a great success, not only from the actual orders received, but from a propaganda viewpoint; every opportunity being taken by the staff to illustrate and further the claims of gas.

Lightning Fires a "Gas Torch."—A somewhat remarkable occurrence is reported from Toronto, where, as the result of a heavy thunderstorm on the morning of Sept. 18, flames 3 ft. long blazed out for four hours from two apertures in the top of a Toronto Transportation Commission hollow iron pole. It is explained that lightning struck the pole, grounded, tapped a gas main immediately beneath it, and ignited the gas. The gas thereupon came rushing out from the only escape vents available, beside 500-volt high-tension feeder wires on top of the pole. Employees of the Toronto Consumers' Gas Company were soon on the spot, and at once proceeded to dig-down to the mains nearby, in order to shut off the gas. This was the only alternative to shutting off the gas supply to the entire street.

WE CAN SUPPLY

GAUGES

TO SUIT YOUR REQUIREMENTS IN

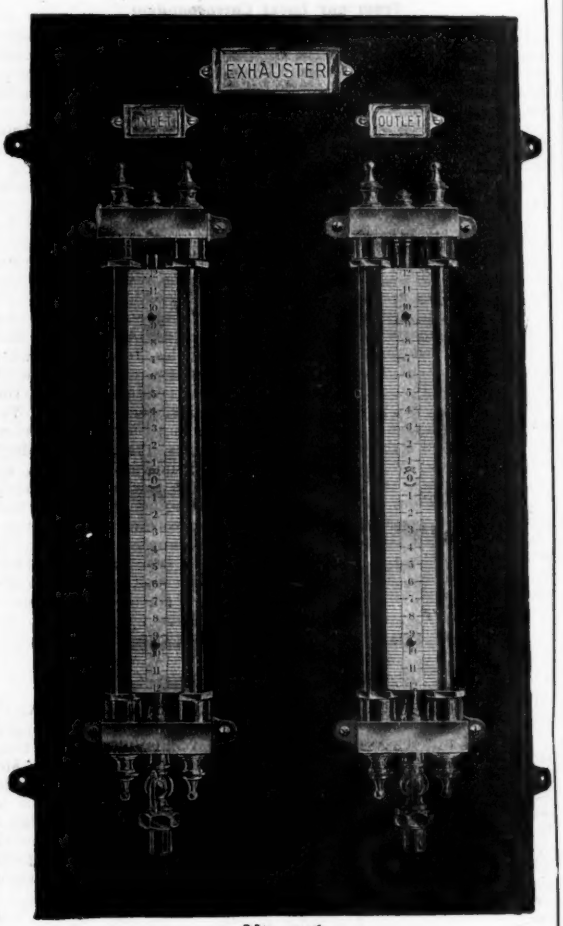
SIZE,

PURPOSE,

AND

QUALITY.

ENQUIRIES SOLICITED.



No. 146.

SAWER & PURVES

(BRANCH OF METERS LTD.),

Miles Platting, MANCHESTER.

Radford Road, NOTTINGHAM.

45 & 47, WESTMINSTER BRIDGE ROAD,

LONDON, S.E.1.

Telephone Nos.:
3289 (City) MANCHESTER.
2025 (Central) NOTTINGHAM.
2412 (Hop) LONDON.

Wires:
"SAWER MANCHESTER."
"SAWER NOTTINGHAM."
"METRIQUE LAMB LONDON."

STOCK MARKET REPORT.

DURING the week gilt-edged securities were inclined to sag, which was attributed to the removal of the embargo on foreign loans. One such issue has already been announced—the Gold Coast £4,628,000 4½ p.c. Inscribed Stock at 94. It is also expected that a Kenya Colony loan for railway purposes will follow shortly. It is not likely, however, that there will be a glut of these loans, as issuing houses are fully aware that undue optimism has at times unhappy results. Foreign Government stocks firmed-up in spite of the fluctuations in the French francs, which caused considerable disturbance; Paris buying and selling alternatively for no apparent reason.

On the whole the Exchange closed in cheerful mood. Trade reports are still favourable, and the chief interest was centred in the Miscellaneous Market. The Coal and Iron group continued to receive support, but inquiries are made cautiously. Profit-taking in the popular issues resulted in slight declines in value, Courtaulds and Imperial Tobaccos being particularly affected. Dunlops improved on the strike settlement, and more business was done in Oils, chiefly owing to the excellent figures shown by the Anglo-Persian report.

As usual, very little information was obtainable about Gas Stocks and Shares other than the variations in the quotations. The improvement of the past few weeks was maintained; and it will be observed that, apart from a local exchange drop of 1 point in South Shields consolidated, the variations in the case of the Home Companies were in an upward direction. More confidence is displayed in this market, and there are comparatively few sellers, especially of Provincial Companies' stocks.

The following transactions were recorded during the week:

On Tuesday, Alliance and Dublin 70½, Brentford "A" 98½, British 105½, 106½, Cape Town 4½ p.ct. 1st mt. debenture 72, Commercial 4 p.ct. 80, 81½, Croydon maximum dividend 83, Gas Light and Coke 83½, 84, 84¼, 84½, 84⅜, 85, 4 p.ct. preference 78⅜, 79½, 79⅝, 3 p.ct. debenture 59½, Primitiva 12s. 10½d., 13s., 13s. 1½d., 13s. 3d., South Metropolitan 92½, 93⅜, South Suburban 5 p.ct. 98, Southampton 5 p.ct. maximum 78¾ *ex* div.

On Wednesday, Aldershot 4 p.ct. preference 73½, Alliance and Dublin 70½, 71, Brentford "A" 98, British 106, Commercial 4 p.ct. 80, 3½ p.ct. 80, Continental Union 39, 40, 41, Croydon sliding-scale 99½, 100, Gas Light and Coke 84¼, 84½, 85, 85⅛, 4 p.ct. preference 78⅞, Hastings and St. Leonards 5 p.ct. 93½, Imperial Continental 146, Lea Bridge 97, Montevideo 70, Primitiva 12s. 9d., 12s. 10½d., 12s. 11¼d., 13s., 4 p.ct. debenture (1911) 65, 66, South Metropolitan 93, 93¼, 93⅜, 3 p.ct. debenture 59, South Suburban 5 p.ct. 99, Southampton 5 p.ct. maximum 79½, Tottenham "B" 88. Supplementary prices, Mid-Kent 5 p.ct. 1st. mort. debenture 56s. 3d., 57s. 6d.

On Thursday, Aldershot 4 p.ct. preference 73⅛, Brentford "A" 99½, Cape Town and District 4½ p.ct. 1st mort. debenture 73, Commercial 4 p.ct. 81, 82, Gas Light and Coke 84, 84¼, 84½, 85⅜, 3½ p.ct. maximum 60, 61, 4 p.ct. preference 80, 3 p.ct. debenture 60½, Imperial Continental 3½ p.ct. debenture 71⅞, Portsea Island "A" 104⅜, Primitiva 12s. 6d., 12s. 7½d., 12s. 9d., 13s., South Metropolitan 92½, 93, 6¼ p.ct. debenture 102½, 103¼. Supplementary prices, Metropolitan (of Melbourne) 8⅝, 8¹¹⁄₁₆.

On Friday, Aldershot "C" 76¼, Bombay 19s., 19s. 3d., Bournemouth "B" 12⅜, Brentford "A" 98, 98½, 100, "B" 100, Commercial 4 p.ct. 82, 3 p.ct. debenture 58¼, 58½, European 6¾, 6⅞, 7, Gas Light and Coke 84⅛, 84½, 85, 3½ p.ct. maximum 61, Imperial Continental 144, 144½, 146, Oriental 104½, Primitiva 12s. 6d., 12s. 7½d., 12s. 9d., 12s. 10½d., San Paulo 6 p.ct. preference 7⅞, South Metropolitan 94, South Suburban 5 p.ct. 98, 5 p.ct. debenture 96¼, Wandsworth "C" 92.

Money was scarce at the beginning of the week; but on Friday the position in the short loan market was easier. Old day-to-day loans were renewed at from 3½ p.ct. to 3¾ p.ct., but balances at the end of the day were advanced at as low as 2½ p.ct. Discount rates, however, were firmer, and Treasury Bills, which were not allotted in full, averaged £3 18s. 1·44d. p.ct., or 2s. p.ct. higher than the previous week.

The Franch franc dominated the Foreign Exchange Market. A new record of 123¼ was touched earlier in the week, and on Friday the rate fluctuated between 119 and 122⅜, the closing quotation being 122. The Brussels rate remained unaffected by the rise in the Belgian Bank rate, and closed at 106.90, Italian lire receded to 122¹⁵⁄₁₆. Sterling on New York moved within narrow limits, finally closing at 4.84.

Silver was firmer owing to a cessation of Chinese sales and Indian buying, the price rising to 32½d. per oz. Gold remained at 84s. 11½d. per oz.

The Bank Rate is 4 p.ct., to which it was reduced from 4½ p.ct. on Oct. 1. Bankers' deposit rates are 2 p.ct. The deposit rates of the discount houses are 2 p.ct. at call and 2¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Nov. 6.	Rise + or Fall — on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 13	5	5	Aldershot 5 p.c. max. C.	75—78	..	76½
395,402	,,	,,	4	4	Do. 4 p.c. Pref.	70—75	..	73½—73⅝
1,551,868	,,	Oct. 8	6½	6½	Alliance & Dublin Ord.	68—72	..	70½—71
374,000	,,	July 9	4	4	Do. 4 p.c. Deb.	60—65	..	..
300,000	1	Oct. 22	1/7½	1/7½	Bombay, Ltd.	¾—1	..	19/—19/3
170,000	10	Aug. 13	8½	8½	Bournemouth 5 p.c.	12—13	..	..
425,050	10	,,	7	7	Do. B 7 p.c..	12—12½	..	12⅜
150,000	10	,,	6	6	Do. Pref. 6 p.c..	11—12	..	..
50,000	Stk.	June 25	3	3	Do. 3 p.c. Deb..	56—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb..	77—80	..	..
992,045	,,	July 9	6⅛	6⅛	Brentford A Con.	98—103	..	98—100
990,500	,,	,,	6½	6½	Do. B New	98—103	..	100
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	95—98	..	..
306,690	,,	June 11	4	4	Do. 4 p.c. Deb.	76—81	..	..
181,337	,,	,,	6	6	Do. 6 p.c. Rich Red. Deb.	100—105	..	..
214,740	,,	Aug. 27	12½	12	Brighton & Hove Orig.	168—173	..	..
244,200	,,	,,	9½	9	Do. A Ord.	135—140	..	..
1,287,500	,,	July 23	5	5	Bristol 5 p.c. max.	89—91a	..	..
855,000	,,	Oct. 8	7	8	British Ord.	105—110	..	105½—106½
100,000	,,	June 25	7	7	Do. 7 p.c. Pref.	120—125	..	..
130,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	71—76	..	..
100,000	10	May 21	6	8	Cape Town, Ltd.	6¾—7¼	..	..
100,000	10	Nov. 5	4½	4½	Do. 4½ p.c. Pref.	6—6¼*	..	..
150,000	Stk.	June 25	4½	4½	Do. 4½ p.c. Deb.	70—75	+1	72—73
626,860	,,	July 23	6	6	Cardiff Con. Ord.	98—101	..	..
237,860	,,	June 25	7½	7½	Do. 7½ p.c. Red. Deb.	101—104	..	..
157,150	,,	Aug. 13	6½	5	Chester 5 p.c. Ord.	90—95b	..	..
1,313,280	,,	July 23	5/14/8	5⅞	Commercial 4 p.c. Cap.	80—85	+1	80—82
560,000	,,	,,	5⅞	5/3/4	Do. 3½ p.c. Cap.	80—85	+1	80
475,000	,,	June 11	3	3	Do. 3 p.c. Deb.	56—59	..	58½—58⅝
800,000	,,	Oct. 8	—	4	Continental Union, Ltd.	39—42	−1	39—41
200,000	,,	,,	7	7	Do. 7 p.c. Pref.	87—90	..	..
660,000	,,	Aug. 13	6½	6½	Croydon sliding scale	97—101	+1	99½—100
284,975	,,	,,	5	5	Do. max. div.	81—84	..	83
492,270	,,	Aug. 13	9	6	Derby Con.	107—109c	..	..
55,000	,,	June 25	4	4	Do. Deb.	74—76c	..	..
1,002,180	10	July 23	4	6	European, Ltd.	6¾—7¼	−¼	6⅞—6⅞
16,460,070	Stk	Aug. 13	5½	5½	Gas Light & Coke 4 p.c. Ord.	83½—85⅛	+⅛	83⅜—85⅛
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	60—63	..	60—61
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	77—80	..	78½—80
4,761,930	,,	June 11	3	3	Do. 3 p.c. Con. Deb.	59—62	+1	59½—60½
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	—
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Sept. 10	6½	6½	Hastings & St. L. 5 p.c. Conv.	90—95	..	93½
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	71—76	..	..
70,000	10	Sept. 24	10	10	Hongkong & China, Ltd.	18½—19½	..	..
86,600	Stk.	Aug. 13	10	10	Hornsey 7 p.c.	132—137	..	..
1,976,000	,,	May 21	10	59	Imperial Continental Cap.	143—148	..	144—146
226,170	,,	Aug. 13	3½	3½	Do. 3½ p.c. Red. Deb.	70—72	..	71½
235,242	,,	Aug. 13	6½	6½	Lea Bridge 5 p.c. Ord.	95—100	..	97
2,127,340	,,	Aug. 13	5½	5½	Liverpool 5 p.c. Ord.	84—84½b	+1½	83—83 1/16
600,000	,,	Sept. 24	7	7	Do. 7 p.c. Red. Pref.	101½—103½b	..	..
165,736	,,	Aug. 27	8	9	Maidstone 5 p.c. Cap.	118—128	..	..
63,480	,,	June 25	3	3	Do. 3 p.c. Deb.	55—60	..	..
75,000	5	June 25	3	7	Malta & Mediterranean	4—4½	..	..
541,920	Stk.	June 11	4	4	Montevideo, Ltd.	68—72	..	70
1,061,315	,,	Aug. 13	5	5	Newcastle & Gateshead Con.	70½—71½d	..	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref..	75½—76½d	..	..
329,705	,,	June 21	3½	3½	Do. 3½ p.c. Deb.	68—69d	..	68½
15,000	,,	Aug. 27	12	11½	North Middlesex 10 p.c.	160—170	..	..
75,940	,,	,,	8⅜	8 9/16	Do. 7 p.c.	115—120	..	..
300,000	Stk.	May 7	9	7	Oriental, Ltd.	100—105	..	104½
188,120	,,	June 25	7½	7½	Plym'th & Ston'house 5 p.c.	110—115	..	..
60,000	50	Aug. 27	14	14	Portsea Island B	93—96	..	..
100,000	50	,,	13	13	Do. C	90—95	..	..
2,189,909	1	—	—	—	Primitiva Ord.	12/6—13/6	..	12/6—13/3
302,600	100	June 2	4	4	Do. 4 p.c. Red. Deb.	78—80	..	..
600,000	Stk.	July 23	4	4	Do. 4 p.c. Red. Deb. 1911	64—66	..	65—66
193,744	,,	June 25	4	4	Do. B. Aires 4 p.c. Rd. Db.	63—67	..	..
264,496	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	63—67	..	..
150,000	10	Sept. 24	6	6	San Paulo 6 p.c. Pref.	7½—8	..	7⅞
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	42—45	..	..
270,000	Stk.	Aug. 27	5⅛	5⅛	Sheffield A	98—100s	..	—
419,968	,,	,,	5⅛	5⅛	Do. B	98—100s	..	—
1,047,000	,,	,,	5⅛	5⅛	Do. C	98—100s	..	—
90,000	10	June 11	6	4	South African	7—9	..	..
4,609,895	Stk.	Aug. 13	6¼	5	South Met. Ord.	92—94	..	92½—94
1,895,445	,,	July 9	3	3	Do. 3 p.c. Deb.	57—60	..	59
734,000	,,	Sept. 10	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	+½	102½—103½
91,500	,,	Aug. 13	8½	8½	South Shields Con.	130—132d	−1	..
1,187,795	,,	July 23	6½	6½	South Suburban Ord. 5 p.c.	97—101	+1	98—99
368,837	,,	June 25	5	5	Do. 5 p.c. Deb.	95—98	..	96½
647,740	,,	Oct. 22	5	5	South'mpt'n Ord. 5 p.c. max.	78—81	..	78½—79½
121,275	,,	June 25	4	4	Do. 4 p.c. Deb.	70—75	..	..
250,000	,,	Aug. 27	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	June 25	6½	6½	Do. 6½ p.c. Red. Deb.	101—103	..	—
120,000	,,	July 23	8	7½	Tottenham District A 5 p.c.	108—113	..	..
882,275	,,	,,	6½	5½	Do. B 3½ p.c.	87—92	..	88
150,000	,,	July 9	—	28/4	Do. 5½ p.c. Pref.	103—105	—	..
181,255	,,	June 11	4	4	Do. 4 p.c. Deb.	76—79	..	..
358,251	,,	Aug. 27	5	5	Tynemouth Con. and New	70—72d	..	..
107,294	,,	Aug. 27	6½	6½	Uxbridge, Maidenhead, & Wycombe 5 p.c.	93—98	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref.	93—98	..	..
91,800	,,	,,	6½	6½	Do. 5 p.c. Maidenh'd	88—93	..	..
50,000	,,	July 9	9½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	128—133	..	..
355,636	,,	,,	7½	7	Do. B 3½ p.c.	109—114	..	..
392,935	,,	,,	6/9/6	5/19/0	Do. C and New	92—97	..	92
354,000	,,	,,	7⅜	6½	Wimbledon 5 p.c.	103—108	..	..
98,000	,,	,,	7⅛	7⅛	Epsom 5 p.c.	113—118	..	..
88,416	,,	June 25	3	3	3 p.c. Deb.	56—59	..	..

Quotations at:—*a*,—Bristol; *b*,—Liverpool. *c*,—Nottingham. *d*.—Newcastle. *s*,—Sheffield. * Ex. div.

IN THE PRESS.

For Gas Engineers.

THE "JOURNAL" DIARY AND GAS CALENDAR, 1926.

Price **7/6** post free.

For Gas Salesmen.

THE "GAS SALEMAN'S" DIARY AND HANDBOOK, 1926.

Price **3/6** post free.

The books are uniform in size and finish, measuring 7″ × 4¾″, in limp binding with round corners.

NEW EDITION.

GAS *versus* ELECTRICITY.

By "PLANET."

The article by a member of the staff of an Electricity Undertaking which appeared in the "JOURNAL" for July 1 last (pp. 31 and 32) has been reprinted in 8vo. size.

Excellent Propaganda for Gas Undertakings. Price **8/4** per 100.

WALTER KING, LTD., "GAS JOURNAL" OFFICES, 11, BOLT COURT, FLEET STREET, LONDON, E.C.4.

For NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS

See last week's "JOURNAL," p. 304.

Telegrams: "GASKING, FLEET LONDON." Telephone: Central 6055.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.2.

OXIDE OF IRON
FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE
PURCHASED IN ANY DISTRICT.

Telegrams: "PURIFICATION, LONDON."
Telephone: LONDON WALL, 9144.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

THE BRITISH GAS PURIFYING MATERIALS CO., LTD.,
99, LONDON ROAD, LEICESTER.
Telegrams: "BRIPURIMAT, LEICESTER." Telephone: LEICESTER 5096.

Solicit enquiries for:—
NATURAL BRITISH PURIFYING MATERIAL,
NATURAL HYDRATED OXIDE OF IRON,
BEST QUALITY DUTCH BOG ORE,
BEST QUALITY BELGIAN BOG ORE,
"PREPARED" AND "UNPREPARED" ARTIFICIAL OXIDES.

SPENT OXIDE PURCHASED.

LONDON OFFICE:
34/35, NORFOLK STREET, STRAND, W.C. 2.
Telegrams: "BRIPURIMAT ESTRAND LONDON." Telephone: CENTRAL 6861.

J. E. C. LORD (Manchester), Ltd.,
Ship Canal Tar Works, Weaste, Manchester.
Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, &c.

GEORGE WILSON GAS METERS, Ltd.
for
GAS-METERS, ORDINARIES, SLOTS, AND REPAIRS.
Foleshill Road, COVENTRY.
Telephone: 596. Telegrams: "GASMETER,"
and at 268, Stockport Road, MANCHESTER.
Telephone: RUSHOLME 976. Telegrams: "GASMETER,"
and 46 & 47, Auckland Street, LONDON, S.E. 11.
Telephone: HOP 647. Telegrams: "GASEOUS LAMB."

SULPHURIC ACID.

SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.,
36, Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN, LONDON."
Telephone—ROYAL 1166.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.

WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.

REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 815, Oldham, and 2412 Hop, London.

Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

MEWBURN, ELLIS, & CO.,
CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70 & 72, Chancery Lane, London, W.C. 2.
Telegrams: "Patent, London." Phone 243 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

"LUX" PURIFYING MATERIAL

THE PREMIER MATERIAL FOR GAS PURIFICATION.

THOS. DUXBURY AND CO.
SOLE AGENTS FOR
ENGLAND, SCOTLAND, IRELAND, WALES AND THE COLONIES (except CANADA).

16, DEANSGATE, MANCHESTER. *Telegrams:* "Darwinian, Manchester." *Tel. Nos.:* 8268-9 City.

PALACE CHAMBERS, WESTMINSTER, S.W.1. *Telegrams:* "Darwinian, Parl, London." *Tel. No.:* 6273 Victoria.

WEIGHBRIDGES

FOR Motor Lorries and Railway Traffic can be seen erected at our works READY FOR DELIVERY. Inspection by your Engineer invited and a test by your Local Inspector of Weights and Measures before delivery. Every machine a High-Class Engineering Product and fully guaranteed.
CHARLES ROSS, LIMITED,
SHEFFIELD.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.

We Guarantee promptness with efficiency for Repairs.

JOSEPH TAYLOR (SATURATORS), LTD., Chemical Plant Engineers, Blackhorse Street Mills, BOLTON.
Telegrams—"SATURATORS, BOLTON." Telephone 848.

FOUNDRIES, LTD., HALIFAX.

MANUFACTURERS of Purifiers, SCRUBBERS, CONDENSERS, WASHERS, and COMPLETE GAS PLANT.
RETORT WORK A SPECIALITY.
Your Esteemed Inquiries Solicited.

OXIDE OF IRON.
SPENT OXIDE BOUGHT.

BALE & CHURCH, LTD.,
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Royal 1484.

"TORTO" FIRE CEMENT.

BALE & CHURCH, LTD.,
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Royal 1484.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.
(*See "The Gas Salesman," Oct. 28, p. 228*).

BALE & CHURCH, LTD.,
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Royal 1484.

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.

See Advertisement, Oct. 21, p. 187.

PATENTS, Trade Marks, Inventions Advice, Handbook and Consultations free. KING'S PATENT AGENCY LTD., Director B. T. KING, C.I.M.E., Regd. Patent Agent, G.B., U.S., and Can., 146A, QUEEN VICTORIA ST., E.C. 4, and 6, QUALITY CT. (next Pat. Off.), LONDON, W.C. 39 years' refs. 'Phone Cent. 682.

ADD to the brilliance of your show-ROOM and Window Display by using BETTERWAY INTERCHANGEABLE SIGNS—high class, neat, arresting, compelling, the best Signs obtainable. Special schemes, our study. Write for particulars.
BETTERWAYS, LTD., Dept. L., 33, GT. QUEEN ST., W.C.2.

WE Specialize in Small Gas-Works and Solicit Inquiries for COMPLETE WORKS EXTENSIONS, and RENEWALS.
Penney & Porter (Engineers), Ltd.,
LINCOLN.
Established 1855.
Telegrams: Porter, Lincoln. Telephones: 266 & 211.

APPOINTMENTS, &c., WANTED.

EXPERIENCED Cookery Demonstrator and Lecturer. 1st Class Diplomée. Chef trained, lately with large firm Gas Stove Manufacturers. OPEN FOR ENGAGEMENTS, Gas Exhibitions and Demonstrations.
Mrs. W. M. E. COYLE, 44, LAMBOLLE RD., BELSIZE PARK. 'Phone Maida Vale 4420.

DISTRIBUTION SUPERINTENDENT.

ENERGETIC, Practical Superintendent, of good Address, desires APPOINTMENT as above, or as Commercial Assistant with full control of Outdoor Department. Progressive Company preferred, where ability to Organize and Control will be appreciated, and substantial Remuneration paid.
Inquiries to No. 7604, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C.4.